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NATIONAL DAM INSPECTION PROGRAM. PLACID LAKE DAM, (NDS I.D NUMB--ETC(U)
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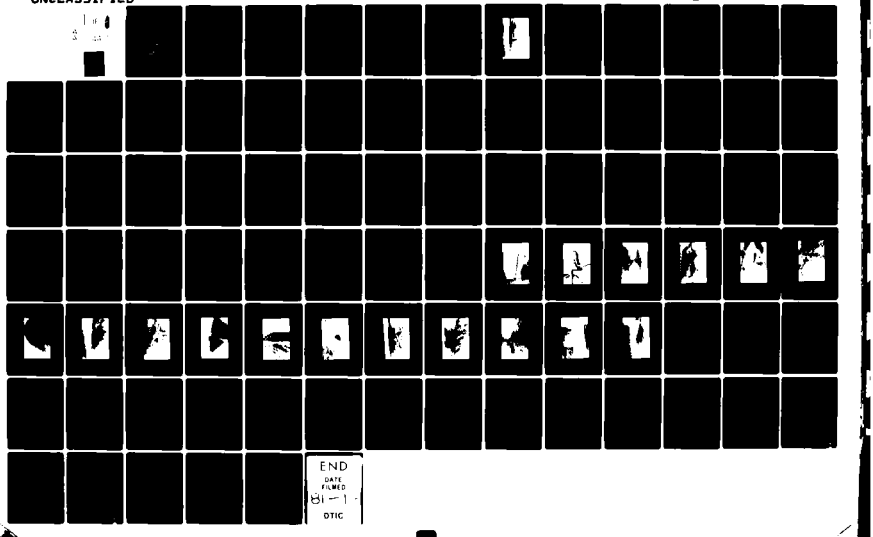

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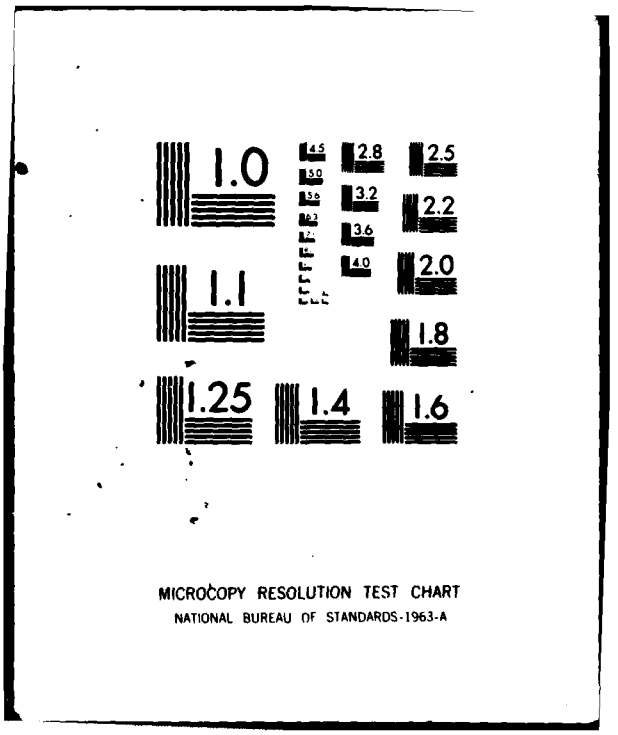
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DELAWARE RIVER BASIN

LAUREL RUN, CARBON COUNTY

PENNSYLVANIA

NDS ID PA. 00616

DER ID 13-97

PLACID LAKE DAM

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DACW-31-80-C-0018

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

AUGUST 1980

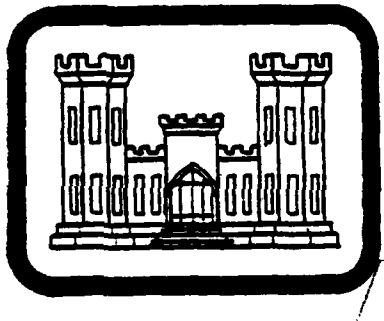
"Original contains color plates: All DTIC reproductions will be in black and white"

DELAWARE RIVER BASIN

PLACID LAKE DAM, ~~CARBON COUNTY~~
~~PENNSYLVANIA~~

NDS I.D ~~NO.~~ PA ~~00~~616
DER I.D. ~~NO.~~ 13-97

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



Prepared by:

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Submitted to:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

AUGUST 1980

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected, and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	Placid Lake Dam
County Located:	Carbon County
State Located:	Pennsylvania
Stream:	Laurel Run
Coordinates:	Latitude 41° 2.0'
	Longitude 75° 37.0'
Date of Inspection:	June 12, 1980

Placid Lake Dam is owned by the Holiday Pocono Civic Association, Inc. The dam and reservoir are used for recreational purposes. The dam was built as part of a residential community and was completed in 1963.

Visual inspection indicates that the spillway system of Placid Lake Dam is in fair condition, the upstream embankment face is in poor condition, the crest and downstream embankment face are in good condition, and the vegetation is in very poor condition. The overall rating of the dam is fair.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" size dam and "High" hazard potential classification is one-half to the full Probable Maximum Flood (PMF). Based on the small total reservoir capacity and the limited number of downstream residences, the one-half PMF has been selected as the spillway design flood.

Hydrologic and hydraulic computations presented in Appendix D indicate the spillway structure is capable of discharging the one-half PMF event without overtopping the embankment under design conditions. Existing conditions, with the flashboard structure in place, reduce the spillway capacity to about 0.33 PMF. It is further assessed that the embankment is not likely to fail during the one-half PMF. Therefore, the structure is considered to have an "Inadequate" but not "Seriously Inadequate" spillway classification.

It is recommended that the following measures be undertaken immediately. Items 1, 3 and 4 should be performed under the supervision of a registered professional engineer experienced in the design and construction of dams.

(1) A detailed hydrologic/hydraulic investigation should be performed to determine the best method of increasing the spillway capacity.

(2) ~~In lieu of the above~~ Or, the flashboard structure should be permanently removed from the top of the spillway drop inlet.

(3) An investigation should be made into the actual cause of the apparent piping voids in the vicinity of the inlet conduit.

(4) The spillway conduit joints should be sealed and the two downstream pipe lengths should be monitored for possible horizontal movement.

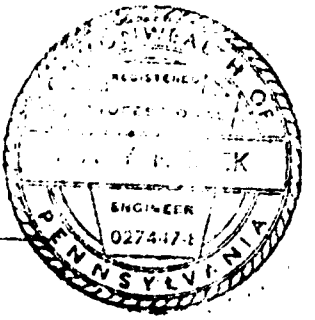
(5) Erosion of the upstream face should be halted and the damaged embankment repaired.

(6) The inlet sluice gate and the reservoir drain gate valve should be lubricated and exercised on a regular basis to insure their operational status.

(7) All trees and brush should be removed from the downstream embankment face, the embankment returned to its original condition, and measures taken to establish a good stand of vegetation.

(8) The rock dam in the diversion channel should be removed.

Because of the potential for property damage and loss of life in the event of failure, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented for this facility. This procedure should include specification of when the inlet sluice gate should be closed to reduce reservoir inflow and who shall perform this operation, and a method of warning downstream residents if high flows are expected and provisions for evacuating these people in the event of an emergency. It is recommended that an operation and maintenance manual be developed, including a checklist of items to be inspected regularly. It is further recommended that this manual include provisions for the maintenance of embankment vegetation in the best possible condition.



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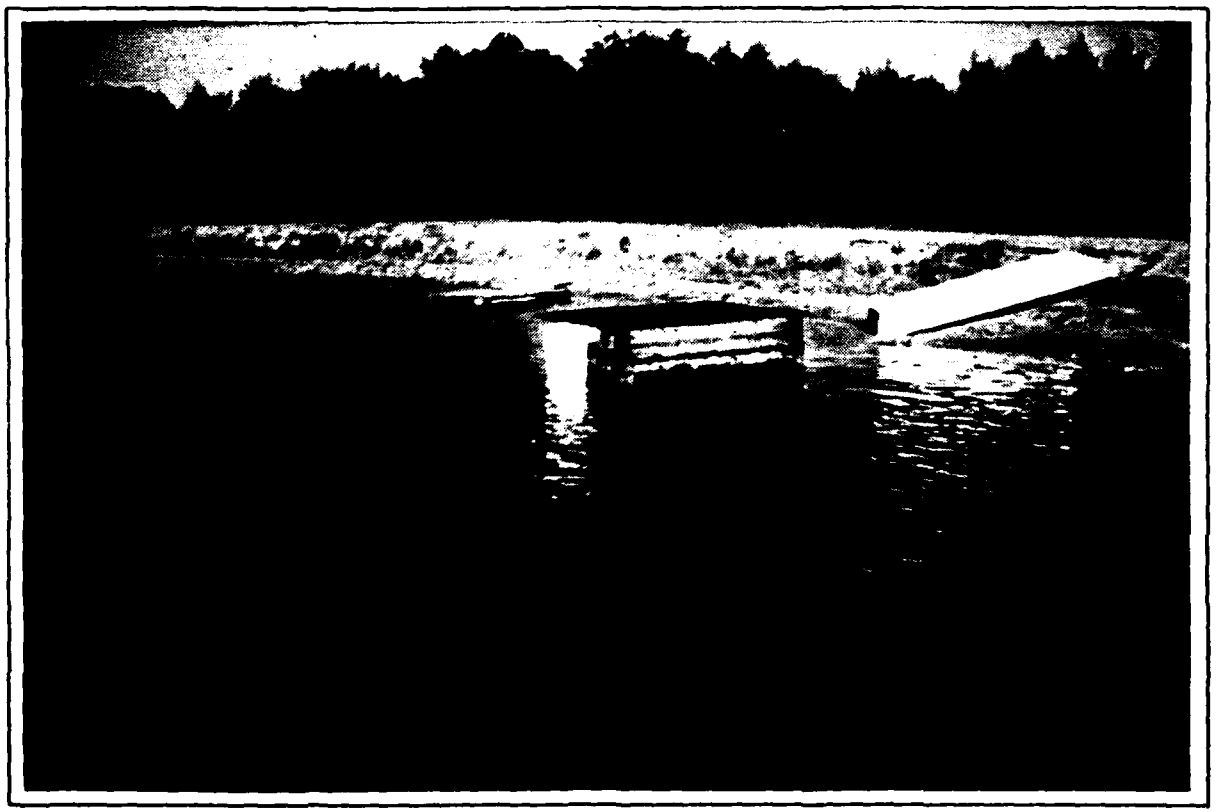

OVERVIEW
PLACID LAKE DAM, CARBON COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PLACID LAKE DAM
NATIONAL ID NO. PA 00616
DER NO. 13-97

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

b. Purpose. The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Placid Lake Dam is a homogeneous earth embankment, approximately 22.5 feet high, across Laurel Run. The approximately 2,700 foot long dam impounds an estimated 240 acre-foot reservoir, with the reservoir level at the top of the dam, within a 0.36 square mile drainage basin. The dam forms three sides of an approximately rectangular shaped lake. Laurel Run enters the reservoir through a 24 inch sluice gate and 40 feet of 24 inch concrete pipe through the embankment near the right abutment. A diversion channel was constructed to carry large flows in Laurel Run around the reservoir to the original stream bed downstream from the dam. A wooden weir was installed to direct the normal flow in Laurel Run into the reservoir rather than through the diversion channel.

Both the upstream and downstream side slopes of the dam have a design slope of 2H:1V. Existing downstream face slopes range from 2.6H:1V to 3.5H:1V, and upstream slopes above the waterline range from near vertical to 1.9H:1V. A downstream berm with a 10H:1V slope was constructed over a one foot thick filter blanket; Plate 2, Appendix E. The width of the berm is shown to be equal to one-third of the width of the dam embankment. The design embankment crest widths ranged from 10 to 13 feet, measured widths were 10 and 11 feet. The downstream face is protected by vegetation. The downstream

face and crest of the dam were to have been covered with topsoil and seeded.

The spillway, approximately 800 feet from the right abutment, consists of a concrete box drop inlet and 78 feet of 48 inch reinforced concrete pipe with two anti-seep collars. Pipe joints are shown on the construction drawings as being caulked and mortared. The inlet is approximately six feet by eight feet and approximately eight feet deep. Water flows over the spillway crest at elevation 1,667, discharging through the concrete pipe beneath the embankment to a shallow plunge pool at the downstream toe. A six inch gate valve near the base of the inlet structure permits a partial drawdown of the lake. (The spillway is not located at the maximum section.) A wooden flashboard box structure is supported by four bricks above the concrete inlet so that, at the time of the inspection, water flowed beneath the structure and into the spillway inlet. During the summer recreation season, the bricks are removed and the reservoir level is raised by about 22 inches.

The spillway outlet discharges into a shallow plunge pool approximately 10 feet wide by 20 feet long. Discharge from the plunge pool flows through a 60 inch diameter concrete culvert beneath the access road to the diversion channel from the right abutment of the dam. The diversion channel approximately parallels the dam for a distance of about 650 feet downstream of the spillway to the original stream bed of Laurel Run. Laurel Run then flows away from the dam in a direction approximately perpendicular to the dam.

The upstream face of the dam is protected by soil-cement. Approximately midway between the right abutment and the spillway inlet is a sand bathing beach area on the upstream slope of the embankment.

b. Location. The dam is located on Laurel Run in Kidder Township, Carbon County, Pennsylvania. The dam site is located approximately 3.7 miles north of Laurel Run and State Route 534. The dam site and reservoir are shown on the USGS Quadrangle entitled "Blakeslee, Pennsylvania" at coordinates N 41° 2.0' W 75° 37.0'. A regional location plan of Placid Lake Dam is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as a "Small" size structure by virtue of its estimated 240 acre-foot total storage capacity and less than 40 foot height.

d. Hazard Classification. A "High" hazard classification is assigned to this structure consistent with the potential for extensive property damage and possible loss of life in the housing development downstream from the dam in the event of failure of the dam.

e. Ownership. The dam is owned by the Holiday Pocono Civic Association, Inc. All correspondence should be addressed to Mr. Gerald R. Umbreit, Chairman, Holiday Pocono Civic Association, Post Office Box 57, Albrightsville, Pennsylvania 18210.

f. Purpose of Dam. The dam and reservoir are used for recreational purposes.

g. Design and Construction History. Placid Lake Dam was designed by Richard N. Harrison, P.E., with consultation from Joseph S. Ward & Associates, Inc. The dam was originally designed as a zoned earth fill embankment, but the design was subsequently changed to a homogeneous earth fill embankment with an upstream soil-cement face. The dam was constructed by Crandon Construction Company of Newton, New Jersey in 1962 and 1963.

According to the construction drawings and a brief description of the dam construction, the initial construction effort was to strip the ground surface along the dam location to a depth of about one foot. A one foot thick filter blanket was then placed beneath the toe of the dam and beneath the downstream berm. The embankment was constructed of available soil materials placed in a compacted lift construction. Documentation of the quality of the embankment compaction is not available. When the embankment reached an elevation five feet below the design normal lake level, construction of the soil-cement protection for the upstream face commenced. Cement was spread over an area approximately seven feet wide at the upstream face of the dam and then blended in with the lift of embankment soils to a nominal depth of six inches. The mixed in place soil and cement were then moistened, mixed further and compacted. The soil-cement was then carried up in subsequent lifts with the fill to the crest elevation of the dam.

There are no inspection reports, letters or memoranda available in the Department of Environmental Resources files relating to the post-construction history of Placid Lake Dam.

h. Normal Operating Procedures. Under normal conditions, all flow is discharged through the drop inlet and the 48 inch diameter pipe. This water is then discharged into Laurel Run. During the recreation season, the flashboard structure is placed on top of the drop inlet spillway to raise the reservoir level 22 inches. The inlet gate at the right abutment of the dam is left open to admit water to the reservoir.

1.3 Pertinent Data.

A summary of pertinent data for Placid Lake Dam is presented as follows.

a.	Drainage Area (square miles)	0.36
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood at Dam Site	Unknown
	Discharge with Reservoir at Top of Dam	
	Spillway Crest at Elevation 1,667 Feet	209
	Spillway Crest at Elevation 1,668.8 Feet	175
c.	Elevations (feet above MSL)(1)	
	Top of Dam	
	Minimum Existing Crest Elevation	1,670.5
	Design Crest Elevation	1,673.0 (without topsoil)
	Spillway Weir Crest (normal pool without flashboards) (1)	1,667.0
	Spillway Crest with Flashboards	1,668.8
	48 Inch Pipe Outlet Invert	1,656.9
	Tailwater (2) (6/12/80)	1,657.0
	Upstream Side of Berm at Maximum Section	1,653.0
	Stream Bed Downstream of Maximum Section	1,648.0
d.	Reservoir (feet)	
	Length at Normal Pool	870
	Length at Maximum Pool	885
e.	Storage (acre-feet)	
	Normal Pool (1,667 ft)	155
	Top of Dam	240
f.	Reservoir Surface (acres)	
	Normal Pool	24
g.	Dam Data	
	Type	Rolled earth fill
	Length	2,700 feet
	Height	22.5 feet

(1) Spillway crest elevation assumed to be 1,667 from USGS map. All other elevations are relative to this elevation.
(2) Downstream of spillway outlet

Crest Width	
Dam	10 to 11 feet
Volume	100,000± cubic yards
Side Slopes	
Upstream	
Design	2H:1V
Existing, Above Waterline	Near vertical to 1.9H:1V
Downstream	
Design	2H:1V
Existing	2.6H:1V to 3.5H:1V
Cutoff	None
Grout Curtain	None

h. Spillway

Type	Concrete box drop inlet & 48 inch RCP conduit
Size	6 feet by 8 feet
Location	About 650 feet right of original stream bed
Energy Dissipator	Plunge pool
Reservoir Drain	6 inch gate valve located at base of inlet

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of the engineering data available for Placid Lake Dam is presented on the checklist attached as Appendix B. Principle documents containing pertinent data used in this report include the permit for constructing the dam issued on May 21, 1962, records of boring logs and construction drawings, and a reprinted magazine article from "Constructioneer" dated August 12, 1963.

b. Design Features. Design drawings of the dam containing plans, profiles and maximum sections are presented in Appendix E. A summary of the features of the dam is included in Section 1.3.

2.2 Construction.

The construction data are limited to the reprinted article from "Constructioneer" magazine that was obtained through the courtesy of the Portland Cement Association.

2.3 Operational Data.

There are no operational records maintained for this dam.

2.4 Evaluation.

a. Availability. All information presented herein was obtained from reports and correspondence located in the Department of Environmental Resources files, supplemented with information supplied by the Portland Cement Association, and conversations with the Owner's representative.

b. Adequacy. The available data are not adequate to evaluate the engineering aspects of this dam.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix A, and are summarized and evaluated in the following sections. In general, the appearance of the upstream embankment face is in poor condition, the crest and downstream embankment face are in good condition, the vegetation is in very poor condition, and the spillway is in fair condition.

b. Dam. The vertical alignment of the dam crest was checked, and the profile is shown on Sheet 5B, Appendix A. The crest elevation ranges from 1,670.5 to 1,674.0, as compared with an original design elevation of 1,673 to 1,675. The dam crest is 10 to 13 feet wide, except in the bathing beach and recreation area, and from that area towards the right abutment the crest width is 30 feet or more. Throughout most of its length, the crest of the dam is characterized by a light brown cemented sand and gravel. In general, there is no evidence of topsoil in either the crest or downstream face, and the dam crest is nearly barren of vegetation; Photograph 7.

The upstream slope of the dam face ranges from vertical to about 1.9H:1V above the water level. The slope of the dam face appears to be much flatter below the water level and very much flatter in the bathing beach area. Throughout the length of the dam, the upstream face is benched at the present water level and has an almost stair step appearance of the horizontal layers of the soil-cement; Photograph 6. The quality of the soil-cement was variable, ranging from hard to friable. In some areas, erosion has undermined well cemented zones. Occasional discrete blocks of the soil-cement were found lying loose at the water level. A slide from the files of the Portland Cement Association was taken in March 1976, from the same point as Photograph 7 looking along the upstream face. Comparing the two pictures disclosed essentially the same condition of the upstream face although progressive deterioration is occurring.

The downstream face of the dam generally appeared to be sparsely vegetated, except in the vicinity of the recreation area, where there is a well maintained grass cover. Occasional areas of the downstream face were eroded, perhaps as the result of foot traffic and rutted as the result of recreation vehicle traffic. In particular, an area in the

vicinity of the existing stream bed is severely eroded as the result of recreation and off-road vehicle traffic on the face of the dam. A windrow of stumps was placed along the toe of the dam in this vicinity to discourage further trespass upon the dam; Photograph 8. Downstream slopes were measured to range from 2.6H:1V to 3.5H:1V. The shallower slopes were in the vicinity of the recreation area. Near the right abutment, a downstream slope of 9.5H:1V was measured where the embankment is of minimal height, and the downstream slope transitions into the original ground surface and from thence into the diversion channel. Brush and trees up to four inches in diameter are growing on the downstream face of the dam. The flat (10H:1V) downstream berm to the left of the access road is very uneven with a stockpile of gravel. Depressions within the uneven area have standing water. At the downstream edge of the slope, where the seepage intercepted by the blanket drain would exist, the downstream woods begin. No seepage was observed, although the very heavy underbush made inspection difficult.

Normal flow in Laurel Run enters the reservoir through the sluice gate; Photograph 4. A weir, shown to the right in Photograph 4, has been placed at the entrance to the diversion channel. The top of the weir is about four feet below the dam crest. At a point 50 feet downstream of the weir, the diversion channel is about 15 feet wide with 3H:1V side slopes. A rock dam, Photograph 14, was constructed across the diversion channel about 300 feet downstream of the weir. The right end of this dam washed out leaving a three foot opening. Farther downstream, erosion has occurred on the left channel bank, increasing the side slope to near vertical; Photograph 15. The diversion channel is dry to a point immediately upstream of where the spillway discharge enters the diversion channel. Standing water is in the channel upstream, and spillway discharge is flowing downstream of the point where the spillway channel joins the diversion channel.

c. Appurtenant Structures.

1. Inlet. The inlet structure at the right abutment of the dam is shown in Photograph 4. This consists of a sluice gate and 40 feet of 24 inch diameter reinforced concrete pipe through the embankment; Photograph 5. Stop logs can be installed on the upstream side of the sluice gate. The sluice gate was opened at the time of the inspection. On the reservoir side of the inlet pipe, several large voids surrounding the pipe were seen in the embankment. These voids extend several feet back into the embankment, and the largest is approximately one foot high.

2. Spillway. A concrete box drop inlet is shown on Photograph 1. The interior of the drop spillway appears to be in good condition, with no evidence of cracking, staining or deterioration of the concrete. As shown on Photograph 1, a flashboard structure is supported on bricks above the lip of the concrete structure. Four plastic pipes on the opposite side of the flashboard structure were installed to discharge cool water from below the reservoir surface. A six inch gate valve is on the drop inlet floor on the upstream side. The valve assembly is rusted and the handle is not affixed to the valve.

A 48 inch reinforced concrete pipe extends from the drop inlet through the dam embankment. The interior of the pipe joints showed frequent staining, leachate precipitation and missing mortar at the joints and occasionally staining or leachate precipitation through the conduit itself. There is also occasional leakage at the pipe joints. The fourth joint from the downstream end had yellow-brown sandy silt clinging to the joint, apparently soil intrusion. The second and third joints from the downstream end had cracks through the mortar 0.5 and 1.0 inches wide, apparent lateral displacement. No caulking was noted at the first joint from the downstream end, and daylight could be seen through it.

The shallow plunge pool below the spillway is ponded with a small amount of water and sustains a growth of cattails. Only a small amount of riprap stone is visible in this basin.

d. Reservoir. The reservoir side slopes are moderate and vegetated with grass or trees to the water's edge. There is no sediment accumulation observed around the intake structure, and a small amount of sediment was observed near a small stream flowing into the reservoir in the vicinity of the left abutment. There was no debris observed around the reservoir's edge.

e. Downstream Channel. From the stilling basin, discharge from the spillway flows through a 60 inch pipe culvert beneath an access road to the recreation area and into the diversion channel. The pipe culvert appeared to be in generally good condition. However, there was some collapse evidenced at the roadway surface overhead. The downstream side of the pipe culvert evidences severe erosion of the roadway embankment. The natural stream channel downstream of the dam is about four feet wide and about three feet high, with side bank slopes of about 1H:1V. Laurel Run flows through a fairly wide floodplain that is characterized by moderate tree growth and very heavy underbrush. There are at least ten residential dwellings located near the natural stream channel downstream of the dam.

3.2 Evaluation.

In summary, the visual inspection of the dam disclosed no evidence of apparent past or present movement that would indicate existing deep-seated instability of the dam. Damage to the embankment has resulted from erosion on the upstream face and consists of voids in the vicinity of the inlet conduit. The cause of the voids should be investigated.

The vegetation protection of the dam is in poor condition, with large bare patches and woody vegetation. Apparently, the topsoil application shown on the drawings was not made. The woody vegetation should be removed and grasses or Crownvetch should be established over the downstream face. The soil-cement appears to provide adequate protection to the dam crest.

The erosion of the upstream face of the dam above the water level is judged to be a characteristic weakness of mixed in place soil-cement. Apparently, mixing of the cement with the soil did not produce a homogeneous mixture throughout the full lift thickness. As a result, less cement was blended with the soil at the bottom of each lift. Although deterioration appears not to have increased significantly since 1976, it is continuing and should be halted. Erosion was also noted around the inlet conduit at the right abutment. This could be a potentially detrimental condition and should be investigated further. The downstream embankment face is in good condition at the present time, except for the ruts and minor erosion around the inlet gate.

The spillway structure is in fair condition. The concrete drop inlet is in good condition. The reinforced concrete outlet pipe from the spillway is assessed to be in poor condition, consistent with the cracked mortaring and leaking of the joints, and especially the apparent displacement of two downstream sections of pipe.

The reservoir drain and inlet sluice gate require routine maintenance. Both should be cleaned, oiled and exercised on a routine basis to assure their functioning.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures.

Lake Placid Dam is operated for recreational uses of a private community. Normal procedures call for maintaining a summer water level in the reservoir 22 inches above the spillway crest elevation. During the non-recreation portion of the year, the flashboard structure is raised and the reservoir level is controlled by the concrete spillway structure. All flow is discharged through the spillway.

4.2 Maintenance of the Dam.

Maintenance of the dam is provided by the Holiday Pocono Association. It appears that maintenance is primarily oriented towards the recreational facilities rather than the dam.

4.3 Maintenance of Operating Facilities.

The Holiday Pocono Association also provides maintenance for the operating facilities of the dam. Other than the seasonal changing of the flashboard structure at the spillway, there does not appear to be any regular maintenance performed.

4.4 Warning Systems In Effect.

There are no formal warning systems or procedures established for implementation during periods of excessively heavy rainfalls.

4.5 Evaluation.

There are no written operational procedures, maintenance procedures or any type of warning systems. Maintenance and operation procedures should be developed, including a checklist of items to be observed, operated and inspected on a regular basis. Maintenance provisions should also provide for adequate maintenance of the embankment vegetation.

Since a formal warning procedure does not exist, one should be developed and implemented for use during periods of high rainfall. This procedure should contain a systematic method of warning downstream residents that potentially high flows are imminent or dangerous conditions are developing.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design/Evaluation Data. There are no original design or evaluation data available for review for this dam other than the notes shown on design drawings included in Appendix E. The watershed contributing runoff directly into the reservoir is long and narrow, approximately 6,000 feet long with an average width of about 1,500 feet, having a total area of 0.36 square miles. Elevations range from about 2,120 feet in the upper reaches of the watershed to a normal design pool elevation of 1,667. The watershed is completely wooded with some residential development. The upper half of the watershed lies within state game lands and Hickory Run State Park. The lower half of the watershed will be developed residentially.

Placid Lake Dam is an off-channel dam built over the original stream bed. Laurel Run was re-routed around the embankment. The watershed contributing flow in the re-routed creek is about 6,000 feet long and averages about 3,000 feet wide, having a total area of 0.55 square miles. Elevations range from a high of about 2,070 feet to an estimated channel invert of about 1,648, where the re-routed channel joins the original stream bed. The watershed is completely wooded, and about two-thirds of it lies within Hickory Run State Park. Part of the watershed will be developed residentially.

In accordance with the criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" dam and "High" hazard potential classification is one-half to the full Probable Maximum Flood (PMF). Because the estimated total capacity of the reservoir is near the lower limit for a "Small" size classification and because of the relatively few inhabited structures downstream, the selected spillway design flood is one-half the PMF.

b. Experience Data. There are no records of reservoir levels or rainfalls maintained for this dam. There are no records or estimates of previous high water levels.

c. Visual Observations. At the time of the inspection the only condition observed that would indicate a reduction in design spillway capacity is that a flashboard box structure is placed on top of the permanent drop inlet, reducing the available freeboard. Observations regarding the condition of the downstream channel, spillway and reservoir are located in Appendix A and are discussed in greater detail in Section 3.

d. Overtopping Potential. The overtopping potential of this dam was estimated using the HEC-1, Dam Safety Version, computer program. A brief description of the program is included in Appendix D. Calculations for this investigation estimate a design spillway discharge of about 209 cfs with a reservoir level at the minimum top of the embankment. Use of the flashboard structure reduces the maximum spillway discharge to about 175 cfs. The HEC-1 program computed a 0.5 PMF peak inflow to be about 363 cfs, assuming the inlet sluice gate is closed. It is estimated that the spillway will pass about 0.33 PMF without overtopping the embankment and that 0.5 PMF will overtop the embankment at the left abutment by about 0.6 foot for nearly six hours when the flashboards are in place. Under design conditions, the spillway is capable of discharging the 0.5 PMF without overtopping the embankment at its minimum point.

An estimate of the effects of a 0.5 PMF storm over the 0.55 square mile watershed, contributing to flow in Laurel Run, was also made. The peak 0.5 PMF value calculated by the program is 634 cfs. The hydrograph was routed through a section adjacent to the reservoir to check the possibility that flow in Laurel Run may overtop the embankment into the reservoir during the 0.5 PMF. Results indicated that during the 0.5 PMF, flow was not expected to enter the reservoir from the diversion channel. The outflow hydrograph from the reservoir and the channel hydrograph were added and routed downstream to the hazard center.

e. Spillway Adequacy. A spillway that will not pass 0.5 PMF without overtopping the embankment is rated as "Seriously Inadequate" provided two other conditions are present, one of which is failure of the dam by overtopping. As Placid Lake Dam is assessed not to fail as a result of overtopping during the spillway design flood from its contributing watershed, the spillway classification for this structure and the existing conditions is considered to be "Inadequate" but not "Seriously Inadequate". If the flashboard structure were to be permanently removed or, alternately, the embankment crest raised, the spillway would be considered to be "Adequate".

f. Downstream Conditions. Placid Lake Dam is constructed within a residential community. About 700 feet downstream of the dam are four houses, and another 100 feet downstream are two more houses, that are subject to damage in the event of a dam failure. The first floor of these houses is about three feet above the channel bank. About 1,700 feet downstream of the dam is the damage center, shown in Photograph No. 16. Two houses are at approximately the top of

bank elevation, two others are about two feet higher. About 200 feet farther downstream is Holiday Lake, essentially an off-channel dam belonging to the community. Normal flows in Laurel Run bypass Holiday Lake, although high flows could be expected to enter the upper end and flow over the dam itself. About 4,000 feet farther downstream, Laurel Run enters Mud Run. At the confluence of the two streams is a mobile home, also subject to damage in the event of a dam failure. Therefore, a "High" hazard potential classification is justified for Placid Lake Dam.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations indicated no evidence of existing or pending deep-seated embankment instability. The soil-cement at the upstream face is assessed not to provide adequate protection to the embankment against wave action. Progressive deterioration and erosion of the soil-cement on the upstream face indicates that repairs and reconstruction will be necessary. Similarly, erosion observed on the downstream face of the dam is assessed to not represent a serious condition at this time. However, these eroded areas should be repaired.

The 48 inch diameter discharge pipe from the spillway was observed to have cracked and leaking joints. Such leakage at the joints, if continued, could be a potentially detrimental condition. Apparent movement was observed of the two downstream sections of pipe. It is recommended that these pipe joints be sealed to prevent any further intrusion of soil from the embankment or leakage of discharge water out of the conduit.

b. Design and Construction Data. There are no design data or calculations documenting the design analysis for the dam known to be available. Similarly, there are no calculations or other documentation available regarding the spillway or hydrologic/hydraulic design of this dam. All data concerning the physical features of the dam were obtained from the limited construction drawings available, a magazine article describing some of the dam construction, and visual observations made for this inspection.

c. Operating Records. No operating records currently exist other than the noted seasonal change of the flashboard structure at the spillway for recreational usage.

d. Post-Construction Changes. There is no documentation concerning any post-construction changes. Based on visual observation of the dam, there does not appear to have been any post-construction changes.

e. Embankment Stability. There were no embankment stability evaluations located with the design drawings in the DER files. Based on the visual observation and geometric configurations, the dam appears to be stable at the present time, provided overtopping does not occur and erosion is controlled.

f. Seismic Stability. The dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. Since the dam is qualitatively assessed to be stable under static loading conditions at the present time, it can also reasonably be considered to be stable under seismic loading conditions.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. Visual inspection indicates that the spillway system of Placid Lake Dam is in fair condition, the upstream embankment face is in poor condition, the crest and downstream embankment face are in good condition, and the vegetation is in very poor condition. Therefore, the overall rating of the dam is fair.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" size dam and "High" hazard classification is one-half to the full Probable Maximum Flood (PMF). Based on the small total reservoir capacity and the limited number of downstream residences, the one-half PMF has been selected as the spillway design flood.

Hydrologic and hydraulic computations presented in Appendix D indicate that the spillway structure is capable of discharging a one-half PMF event without overtopping the embankment under design conditions. Existing conditions, with the flashboard structure in place, reduce the spillway's capacity to about 0.33 PMF. It is further assessed that the embankment is not likely to fail during one-half the PMF. Therefore, the structure is considered to have an "Inadeqate" but not "Seriously Inadequate" spillway classification.

b. Adequacy of Information. The combined visual inspection and simplified calculations presented in Appendix D were sufficient to indicate that further limited investigations are required for this structure.

c. Urgency. It is recommended that the measures presented in Section 7.2 be implemented as specified.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following measures be undertaken immediately. Items 1, 3 and 4 should be performed under the supervision of a registered professional engineer experienced in the design and construction of dams.

(1) A detailed hydrologic/hydraulic investigation should be performed to determine the best method of increasing the spillway capacity.

(2) In lieu of the above, the flashboard structure should be permanently removed from the top of the spillway drop inlet.

(3) An investigation should be made into the actual cause of the apparent piping voids in the vicinity of the inlet conduit.

(4) The spillway conduit joints should be sealed and the two downstream pipe lengths should be monitored for possible horizontal movement.

(5) Erosion of the upstream face should be halted and the damaged embankment repaired.

(6) The inlet sluice gate and the reservoir drain gate valve should be lubricated and exercised on a regular basis to insure their operational status.

(7) All trees and brush should be removed from the downstream embankment face, the embankment returned to its original condition, and measures taken to establish a good stand of vegetation.

(8) The rock dam in the diversion channel should be removed.

b. Operation and Maintenance Procedures. Because of the potential for property damage and loss of life in the event of failure, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented for this facility. This procedure should include specification of when the inlet sluice gate should be closed to reduce reservoir inflow and who shall perform this operation, and a method of warning downstream residents if high flows are expected and provisions for evacuating these people in the event of an emergency. It is recommended that an operation and maintenance manual be developed, including a checklist of items to be inspected regularly. It is further recommended that this manual include provisions for the maintenance of embankment vegetation in the best possible condition.

APPENDIX

A

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *Placid Lake Dam* County *Carbon* State *Pennsylvania* National ID # *PA 00616*

Type of Dam *Earth* Hazard Category *High*

Date(s) Inspection *6/12/80* Weather *Sunny* Temperature *60's*

Pool Elevation at Time of Inspection *1667+* M.S.L. Tailwater at Time of Inspection *1657.0* M.S.L.

Inspection Personnel:

Mary F. Beck (Hydrologist) *Vincent McKeever (Hydrologist)*

Raymond S. Lambert (Geologist) *(Geotechnical)*

Richard E. Mabry Civil)

Mary F. Beck Recorder

Remarks:

Mr Williams, representing the Holiday Pocono Civic Association, was on site and provided assistance to the inspection team

Sheet 1 of 11

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	*N/A*	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	*N/A*	
DRAINS	*N/A*	
WATER PASSAGES	*N/A*	
FOUNDATION	*N/A*	

Sheet 2 of 11

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	*N/A*	
STRUCTURAL CRACKING	*N/A*	
VERTICAL AND HORIZONTAL ALIGNMENT	*N/A*	
MONOLITH JOINTS	*N/A*	
CONSTRUCTION JOINTS	*N/A*	

Sheet 3 of 11

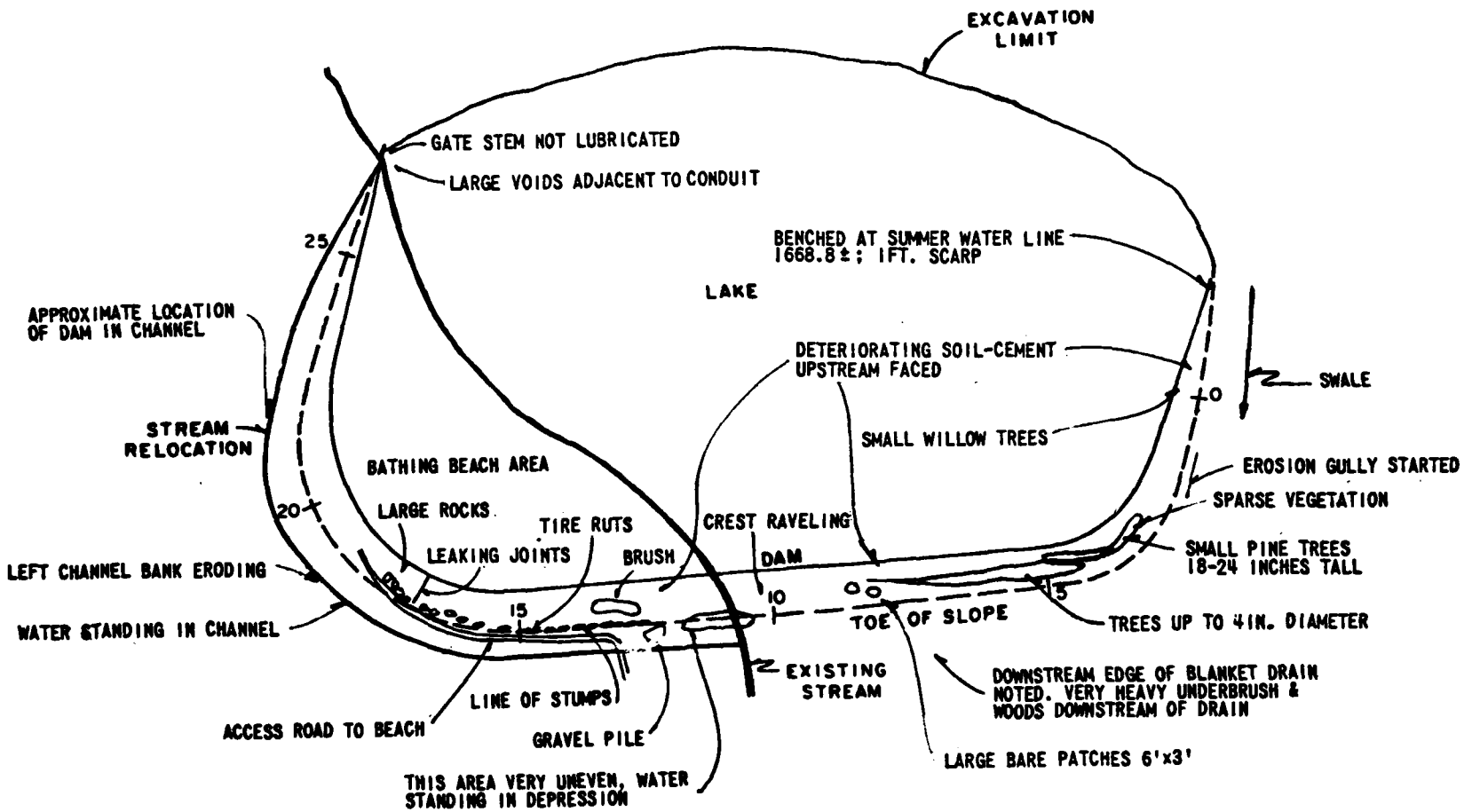
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*None observed.*	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*None observed.*	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*Erosion and/or damage of downstream face has occurred as a result of trail bike or 4-wheel drive vehicle damage. Erosion of upstream face has occurred as a result of the soil-cement deterioration. Upstream face below the water line appears to be in good condition.*	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*See Sheet 5B of 11.*	
RIPRAP FAILURES	*There is no riprap. Upstream face constructed of soil-cement.*	

Sheet 4 of 11

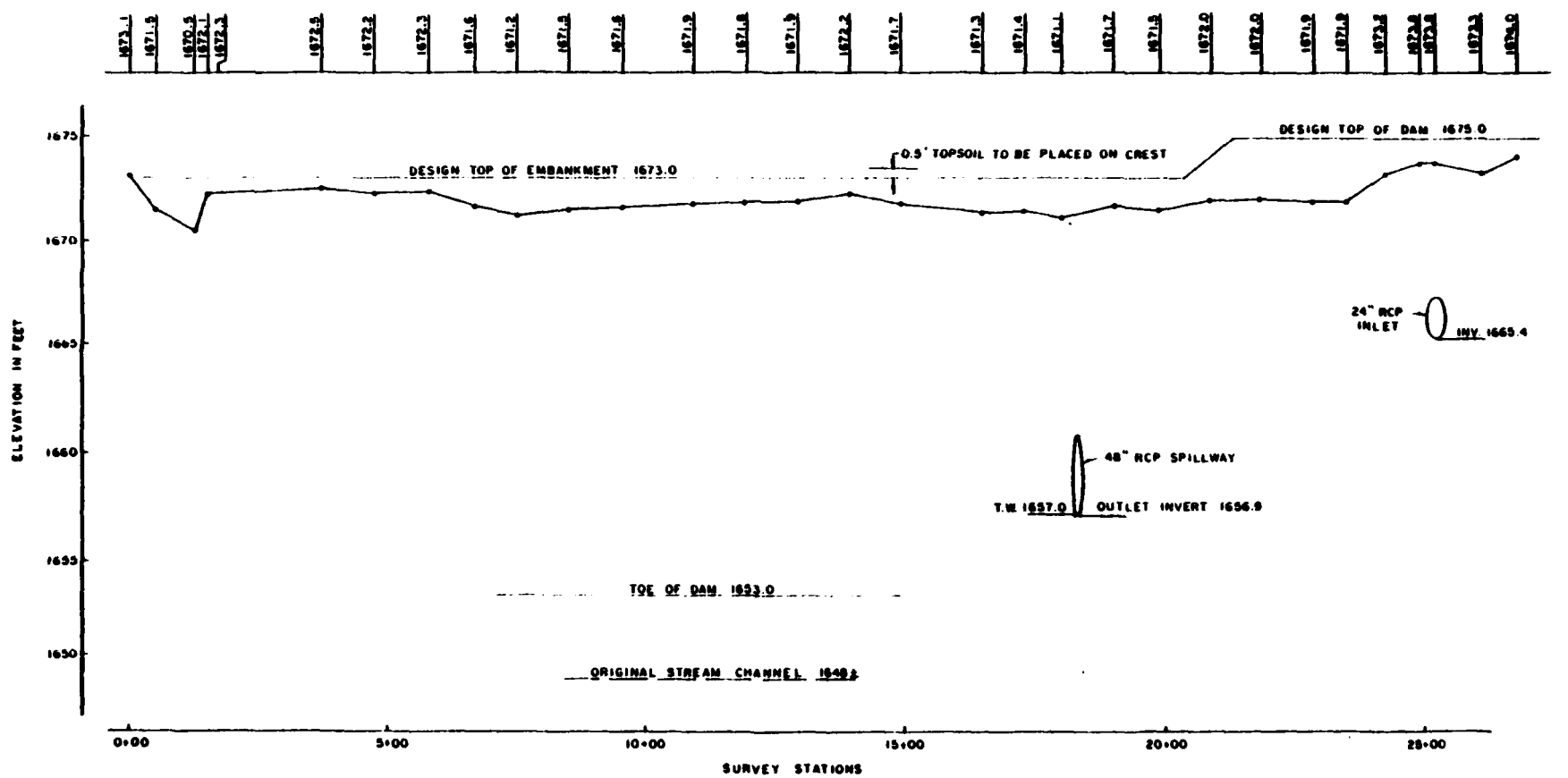
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	*Vegetation is in very poor condition with bare patches as large as 6 feet x 3 feet. Trees up to 4 inches in diameter are growing on downstream face.*	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*All junctions appear in good condition except erosion has occurred at the upstream inlet.*	
ANY NOTICEABLE SEEPAGE	*See Sheet 5A of 11.*	
STAFF GAGE AND RECORDER	*None*	
DRAINS	*None*	



FIELD OBSERVATION PLAN
PLACID LAKE DAM

SHEET 5A OF 11



LOOKING DOWNSTREAM

FIELD OBSERVATION PROFILE
PLACID LAKE DAM

SHEET 5B OF 11

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*Outlet conduit is 4 foot diameter RCP with mortared joints. Mortar is missing from some joints, apparent horizontal movement on the order of ½ to 1 inch has occurred. Some joints leak with leachate deposits.*	
INTAKE STRUCTURE	*Appears in good condition with no surficial concrete deterioration noted.*	
OUTLET STRUCTURE	*None*	
OUTLET CHANNEL	*Conduit discharges into a shallow plunge pool.*	
EMERGENCY GATE	*A 6 inch gate valve on the bottom of the intake structure controls pond drain. Stem appears unlubricated, it was unknown when last operated.*	

Sheet 6 of 11

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	*None*	
APPROACH CHANNEL	*N/A*	
DISCHARGE CHANNEL	*N/A*	
BRIDGE AND PIERS	*N/A*	

Sheet 7 of 11

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	*N/A*	
APPROACH CHANNEL	*N/A*	
DISCHARGE CHANNEL	*N/A*	
BRIDGE AND PIERS	*N/A*	
GATES AND OPERATION EQUIPMENT	*N/A*	

Sheet 8 of 11

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	*None*	
OBSERVATION WELLS	*None*	
WEIRS	*None*	
PIEZOMETERS	*None*	
OTHER	*None*	

Sheet 9 of 11

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	*Reservoir side slopes are moderate and vegetated with woods or grass to water's edge.*	
SEDIMENTATION	*Little sediment and no debris was noted in the reservoir.*	

Sheet 10 of 11

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*The channel is about 4 feet wide with 1H:1V banks 3 feet high. The stream flows through a wooded flood plain with very heavy underbrush*	
SLOPES	*The valley gradient is about 0.02.*	
APPROXIMATE NO. OF HOMES AND POPULATION	*At least 10 houses would suffer some damage in the event of failure. Houses downstream of the first road crossing the stream are about 3 feet above the stream bank. At the second road crossing the stream, one house is at about top of bank level and two others are about one foot above.*	

Sheet 11 of 11

APPENDIX

B

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *Placid Lake Dam*

ID # *PA 00616*

ITEM	REMARKS
AS-BUILT DRAWINGS	*None known.*
REGIONAL VICINITY MAP	*Plate 1, Appendix E.*
CONSTRUCTION HISTORY	*See text, Section 1.2*
TYPICAL SECTIONS OF DAM	*Appendix E.*
OUTLETS - PLAN	*Appendix E*
DETAILS	
CONSTRAINTS	
DISCHARGE RATINGS	*Appendix D*
RAINFALL/RESERVOIR RECORDS	*None*

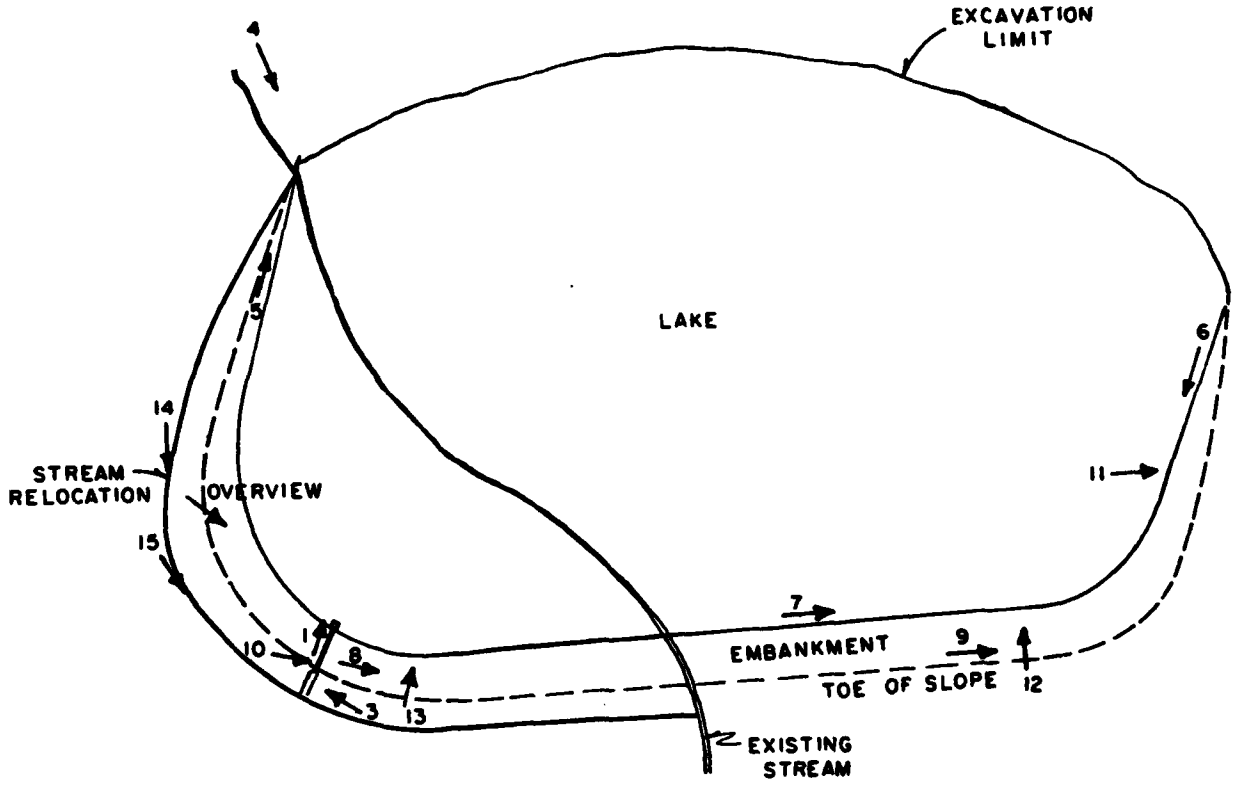
ITEM	REMARKS
DESIGN REPORTS	*None available.*
GEOLOGY REPORTS	*Appendix F.*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	*None available.*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*Only test boring results were available.*
POST-CONSTRUCTION SURVEYS OF DAM	*None known.*
BORROW SOURCES	*Reservoir area.*

ITEM	REMARKS
MONITORING SYSTEMS	*None*
MODIFICATIONS	*None*
HIGH POOL RECORDS	*None*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*None*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None*
MAINTENANCE OPERATION RECORDS	*None*

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	*Appendix E.*
OPERATING EQUIPMENT PLANS & DETAILS	*None available.*
MISCELLANEOUS	*The following information is located in DER files.* 1. *Design drawings, 3 page set.* 2. *Permit to construct a dam, dated May 21, 1962.* *The following was supplied by Portland Cement Association.* 1. *Reprint of "Soil Cement Facing Protects Pocono Dam," Constructioneer, August 12, 1963.* 2. *Slide of upstream face taken March 3, 1976.*

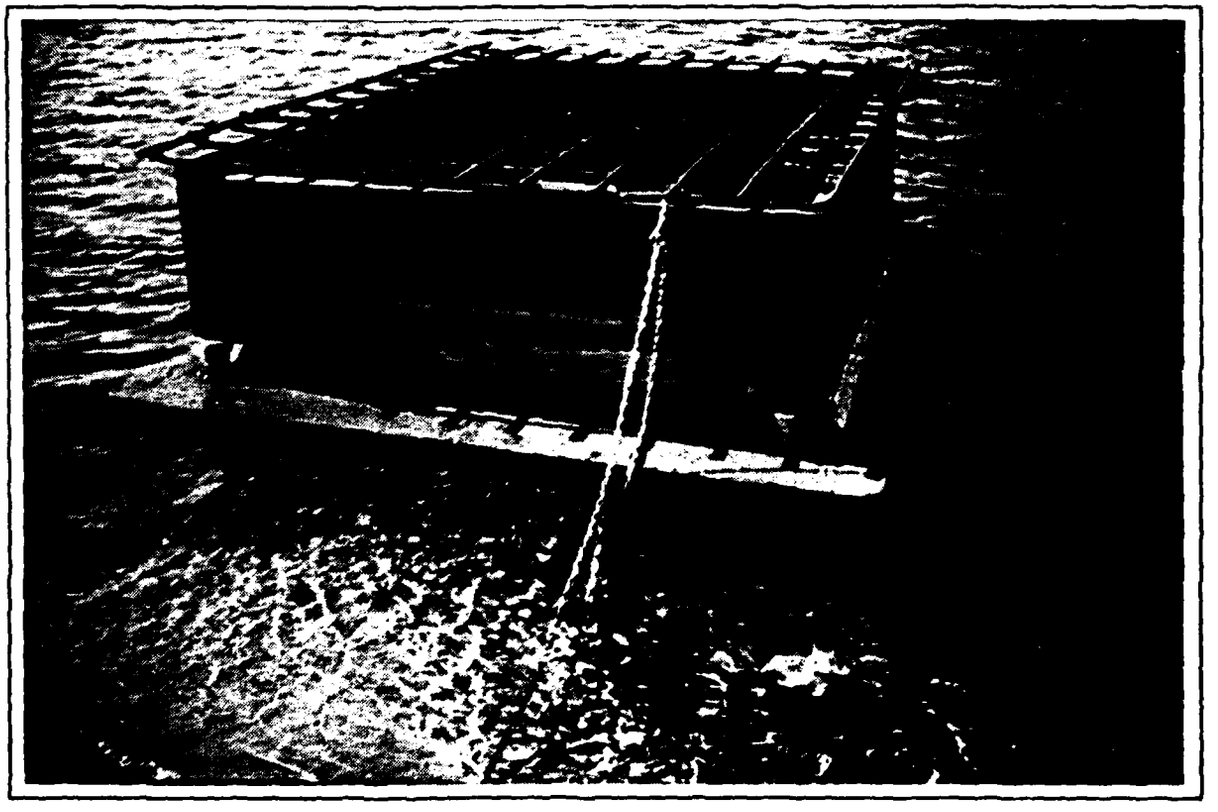
APPENDIX

C



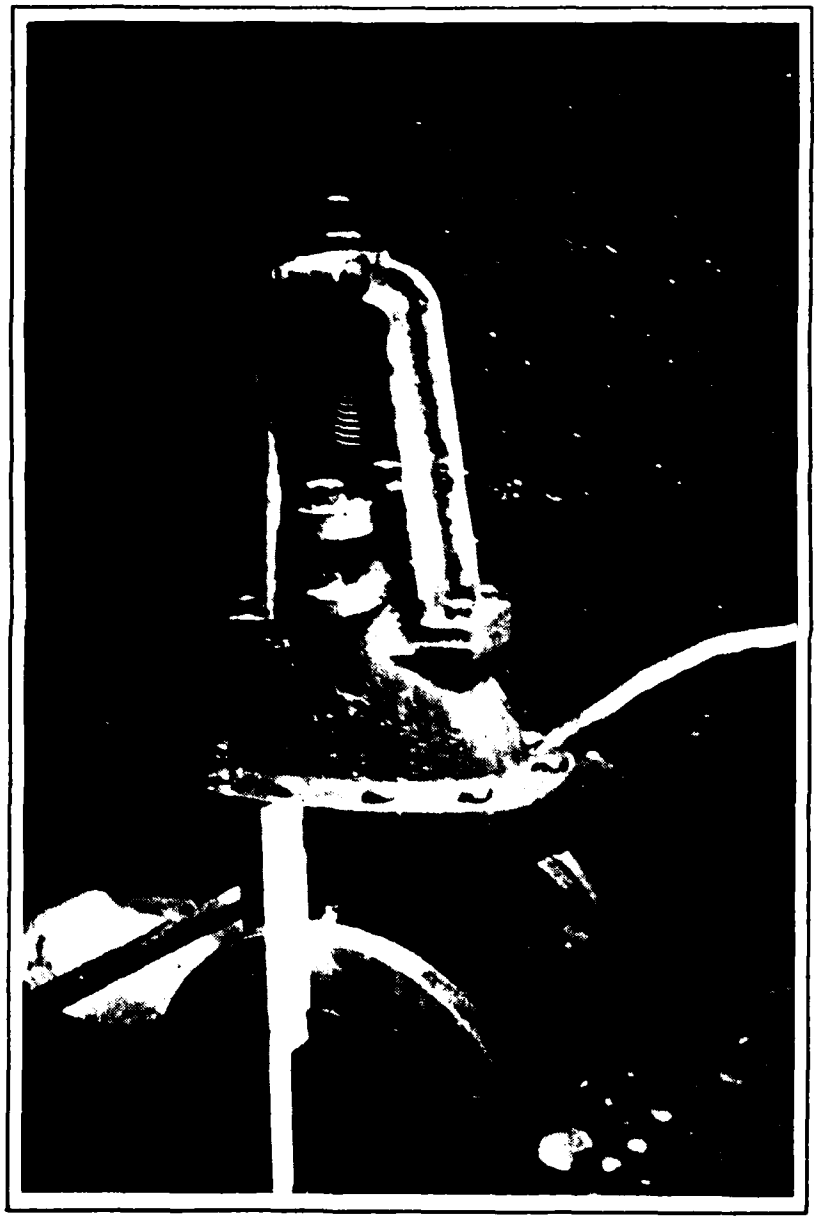
PHOTOGRAPH LOCATION PLAN
PLACID LAKE DAM

PLATE C-1



"FLASHBOARD" BOX PROPPED UP WITH BRICKS, USED TO RAISE RESERVOIR LEVEL IN THE SUMMER.

PHOTOGRAPH NO. 1



POND DRAIN GATE VALVE ON
BASE OF RISER.

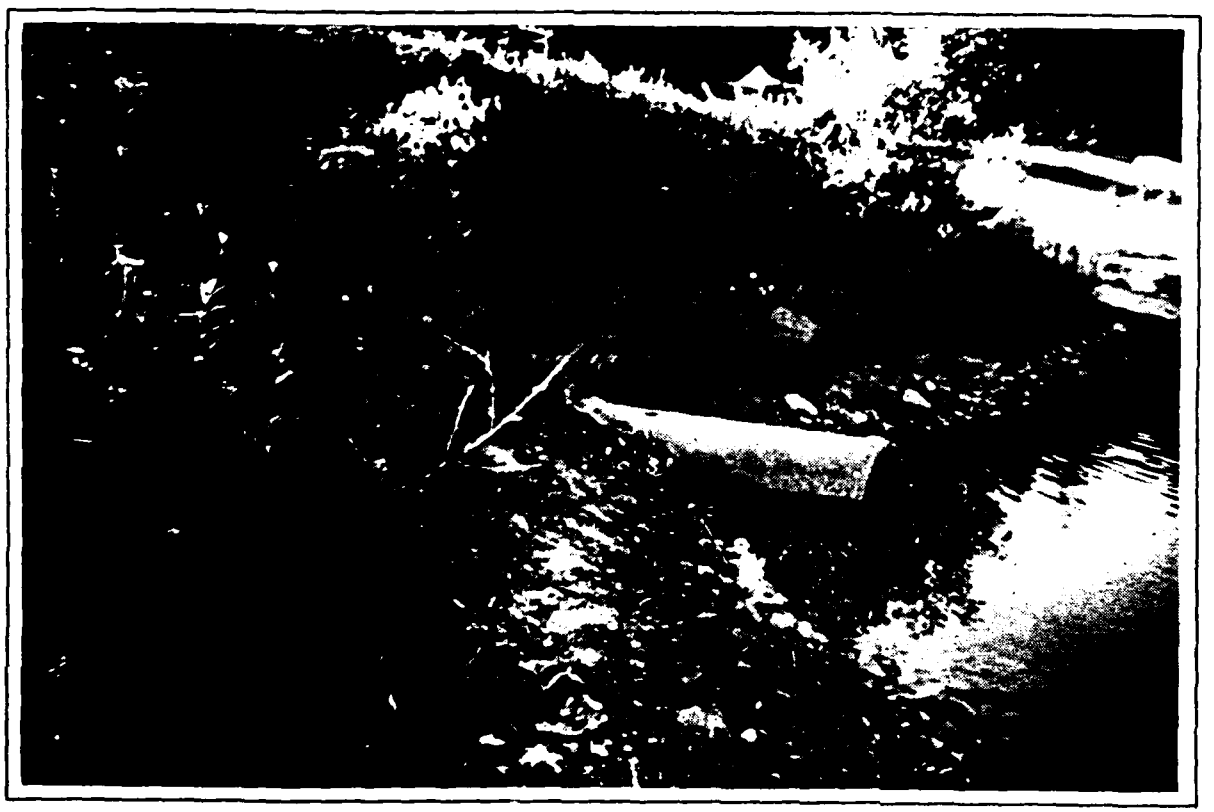
PHOTOGRAPH NO. 2

PRINCIPAL SPILLWAY CONDUIT OUTLET
AND PLUNGE POOL.

PHOTOGRAPH NO. 3

SLUICE GATE CONTROLLING INFLOW TO
RESERVOIR FROM LAUREL RUN. EXCESS
FLOW IN LAUREL RUN FLOWS OVER WOOD
WEIR TO THE RIGHT OF THE SLUICE GATE.

PHOTOGRAPH NO. 4



DISCHARGE END OF INTAKE CONDUIT.

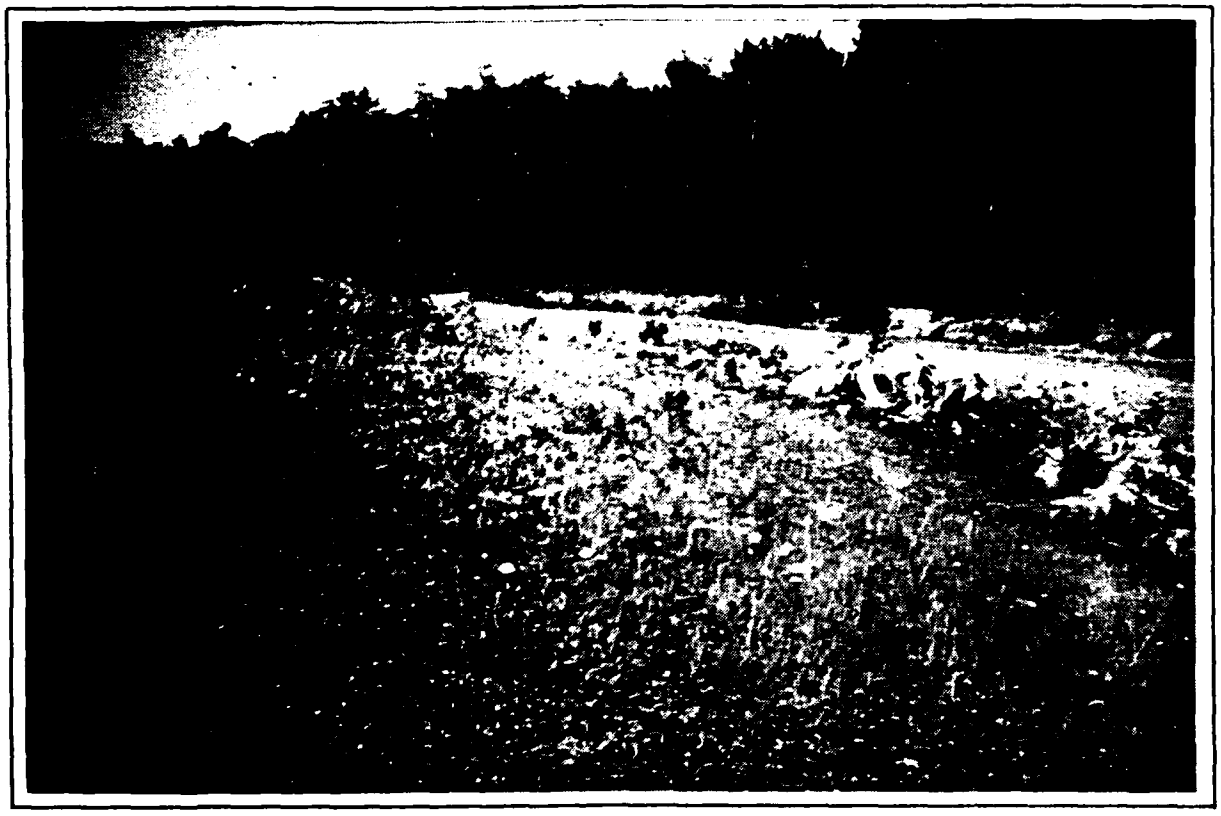
PHOTOGRAPH NO. 5

UPSTREAM FACE, NOTE EROSION RESISTANT
SOIL-CEMENT LEDGE.

PHOTOGRAPH NO. 6

UPSTREAM FACE AND CREST. CREST IS SOIL-CEMENT.

PHOTOGRAPH NO. 7

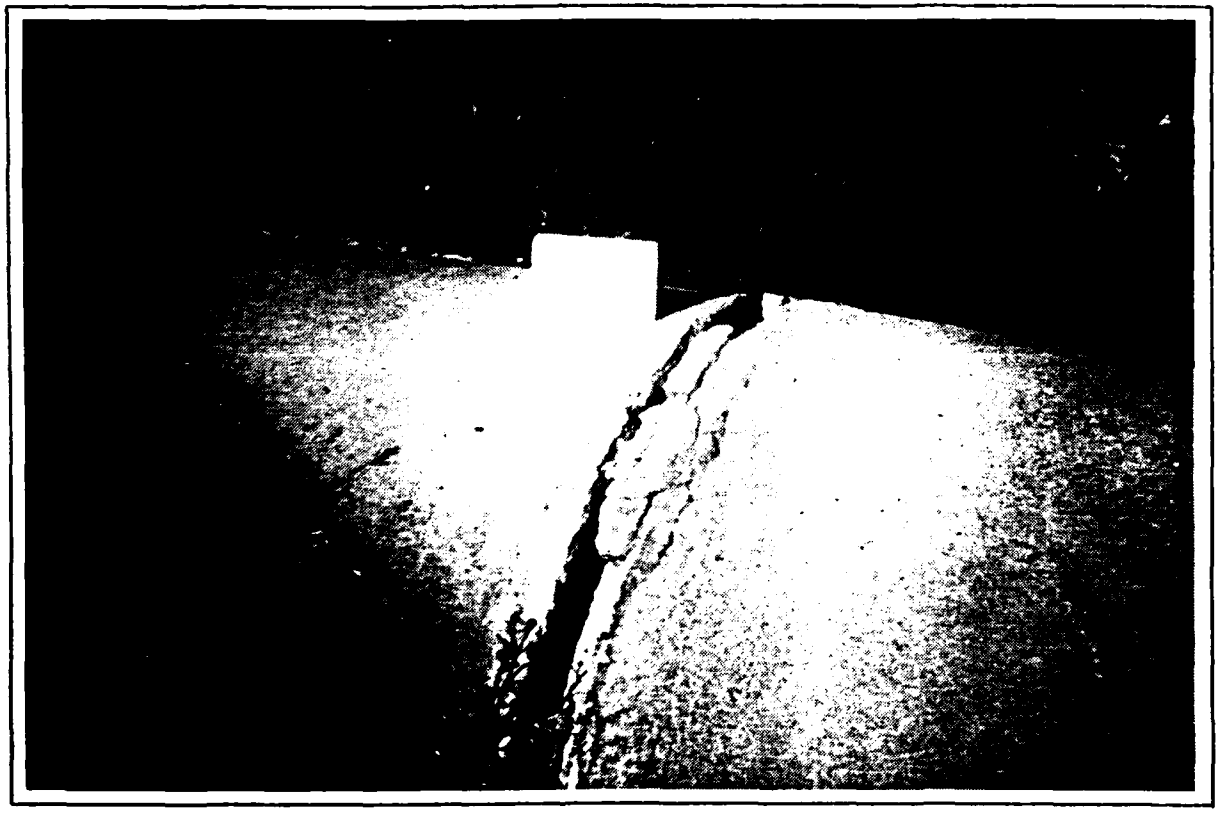


DOWNSTREAM FACE NEAR SPILLWAY.

PHOTOGRAPH NO. 8

DOWNSTREAM FACE. NOTE LARGE BARE PATCHES.

PHOTOGRAPH NO. 9



FIRST JOINT FROM DOWNSTREAM END OF PRINCIPAL SPILLWAY CONDUIT. DAYLIGHT CAN BE SEEN THROUGH JOINT.

PHOTOGRAPH NO. 10

TYPICAL OF SOIL-CEMENT DETERIORATION ON UPSTREAM FACE.

PHOTOGRAPH NO. 11

LARGE BARE PATCHES ON DOWNSTREAM FACE.

PHOTOGRAPH NO. 12

SPARSE VEGETATION NEAR SPILLWAY.

PHOTOGRAPH NO. 13

LAUREL RUN BYPASS CHANNEL. ROCK IN FOREGROUND IS DAM CONSTRUCTED ACROSS CHANNEL WHICH HAS ERODED AROUND ONE END.

PHOTOGRAPH NO. 14

EROSION IN BYPASS CHANNEL. DAM IS IN BACKGROUND.

PHOTOGRAPH NO. 15

TYPICAL DOWNSTREAM DAMAGE CENTER.

PHOTOGRAPH NO. 16

DOWNSTREAM HOLIDAY LAKE DAM.

PHOTOGRAPH NO. 17

APPENDIX

D

PLACID LAKE DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: *100% wooded, approximately half will be developed residentially.*

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): *1667.0 feet (155 Acre-Feet).*

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): *1670.5 feet (240 Acre-Feet).*

ELEVATION MAXIMUM DESIGN POOL: -----

ELEVATION TOP DAM: *1670.5 feet existing, 1673.0 feet, design.*

SPILLWAY

a. Elevation *1667.0 feet, normal; 1668.8 feet, summer.*

b. Type *Concret drop inlet, 48" RCP conduit.*

c. Width *N/A*

d. Length *78 feet*

e. Location Spillover *See Plates, Appendix E.*

f. Number and Type of Gates *None*

OUTLET WORKS:

a. Type *6 inch gate valve.*

b. Location *Floor of drop inlet.*

c. Entrance inverts *Unknown.*

d. Exit inverts *1656.9 feet.*

e. Emergency draindown facilities *The above.*

HYDROMETEOROLOGICAL GAGES:

a. Type *None within watershed.*

b. Location *N/A*

c. Records *N/A*

MAXIMUM NON-DAMAGING DISCHARGE: *Not determined.*

DRAINAGE AREA:(1) *0.36 square miles.*

PROBABLE MAXIMUM PRECIPITATION (PMP)
FOR 10 SQ. MILES IN 24 HOURS:(2) *22.5 inches.*

ADJUSTMENT FACTORS FOR DRAINAGE AREA (%):(3)

Zone	*1*
6 Hours	*111*
12 Hours	*124*
24 Hours	*134*
48 Hours	*142*

SNYDER HYDROGRAPH PARAMETERS:(4)

Zone	*2*	
C_p, C_t	*0.45, 2.1*	
L(5)	*RESERVOIR WATERSHED* *1.37 mile*	*STREAM WATERSHED* *1.89 mile*
Lca (6)	*0.66 mile*	*0.80 mile*
$tp=C_t\ (L \cdot Lca)^{0.3}$	*2.04*	*2.38*

SPILLWAY CAPACITY AT MAXIMUM
WATER LEVEL(7) *209 cfs, design spillway crest elevation; 174 cfs, with flashboards*

---

(1) Measured from USGS maps.
(2) Hydrometerological Report No. 33, Figure 1.
(3) Hydrometerological Report No. 33, Figure 2.
(4) Information received from Corps of Engineers, Baltimore District.
(5) Length of longest water course from outlet to basin divide, measured from USGS maps.
(6) Length of water course from outlet to point opposite the centroid of drainage area, (see Plate 1, Appendix E) measured from USGS maps.
(7) See Sheet 10, 12 of this Appendix.

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quandrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are inputed and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

BY MRB DATE 2/12/80 SUBJECT SHEET 4 OF 12
CHKD. BY REM DATE 2/13/80 Placid Lake Dam JOB No.
Hydrology / Hydraulics

Classification (Ref - Recommended Guidelines for Safety Inspection of Dams)

1. The hazard classification is "High" as there would be excessive economic loss and loss of life in the event of a dam failure.

2. The size classification is "Small" based on its 22.5 foot height and total capacity of 240 Ac-Ft.

3. The selected spillway design flood is 0.5 PMF (Probable Maximum Flood), based on size and hazard classification.

Hydrology and Hydraulic Analysis

1. Original Data - limited to notes on the design drawings.

Reservoir Drainage Area - 250 Ac (0.39 sq. mile)
Stream Drainage Area - 205 sq. mile
Spillway Design Capacity - 275 cfs
C = 3.32
H = 2
L = 28

2. Evaluation Data

Drainage Areas - area were measured from USGS map (Plate 1, Appendix E)

Reservoir Drainage Area - 0.36 sq. mile
Stream Drainage Area - 0.55 sq. mile

Rainfall and hydrograph parameters are shown on Sheet 2.

Elevation - Storage Data, shown on sheet 8
Areas were measured from reservoir drawing enclosed as Plate 2, Appendix E.

Elev. 95	(1652 MSL)	2.3 Ac
100	(1652)	6.3
105	(1662)	11.8
108	(1665)	16.5
108.1	(1665.1)	24.1
116	(1673)	24.5

BY MEB DATE 2/21/80 SUBJECT Placid Lake Dam SHEET 5 OF 12

CHKD. BY REM DATE 2/23/80 Hydrology / Hydraulics JOB No.

Elevation - Discharge Data

Design Conditions - assume flash board structure not in place

$Q = C L H^{3/2}$ - weir control

$L = 28$ ft field checked

$C = 3.1$ King & Brater, Handbook of Hydraulics Table 5-3

$Q = AV$ } pipe control

$H_o = V^2/2g (1 + K_e + K_p L)$ }

H measured from reservoir surface to ℄ of outlet conduit (assume no tailwater)

Invert at 1656.9 ft field checked

K_e - entrance loss, 1.2 Ref - Soil Conservation Service Design Note 8

$K_p = 0.00656$ SCS Nat. Engineering Handbook, Section 5

$L = 78$ ft. $A = 12.57$ ft²

Water Surface	Weir Control H	Q	Pipe Control H	Q	Q
1667	0				0
1668	1	86.8	9.1	185	87
1669	2	245.5	10.1	194.7	195
1670			11.1	204.1	204
1671			12.1	213.1	213
1672			13.1	221.8	222
1673			14.1	230.0	230
1674			15.1	238.0	238
		with flash board structure			
1668.8	0				0
1669.8	1	86.8	10.9	202.2	87
1670.8	2	245.5	11.9	211.5	211
1671.8			12.9	220.0	220
1672.8			13.9	228.4	228
1673.8			14.9	236.4	236

BY MEB DATE 7/21/80 SUBJECT Placid Lake Dam Hydrology / Hydraulics SHEET 6 OF 12

CHKD. BY REM DATE 7/23/80 JOB No.

Spillway Adequacy

Design Conditions - no Flashboards

The spillway is capable of discharging 0.5 PMF without overtopping the embankments. Flow in the channel should not overtop into the reservoir. Therefore, the spillway is considered "Adequate".

Existing Conditions - Flashboards

The spillway is capable of discharging about 0.33PMF without overtopping the embankment. Therefore, the spillway is considered "Inadequate".

When the embankment overtops under existing spillway conditions, the point of overtopping is at the left abutment, see Appendix A, Sheet 5B. At this point, the embankment is of limited height, less than 5 ft, and the downstream slope is fairly flat, therefore, it is assessed that the embankment will not fail by overtopping.

The spillway is "Inadequate" but not "Seriously Inadequate" under existing conditions. If the flash board structure were removed, the spillway would be "Adequate".

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	IN
ROUTE HYDROGRAPH TO	OUT
RUNOFF HYDROGRAPH AT	US1
ROUTE HYDROGRAPH TO	USO
COMBINE 2 HYDROGRAPHS AT	COM
ROUTE HYDROGRAPH TO	DS1
END OF NETWORK	

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79

RUN DATE= 80/07/21.
TIME= 17.38.48.

PLACID LAKE DAM
NAT ID NO. PA 00616 DER NO. 13-97
OVERTOPPING ANALYSIS

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 3 LRTIO= 1
RTIOS= .30 .40 .50

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH DIRECTLY TO RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
IN	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

INVOL	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.36	0.00	.71	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.50	111.00	124.00	134.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .000

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOR	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 2.04 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.30 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 73 END-OF-PERIOD ORDINATES, LAG= 2.04 HOURS, CP= .45 VOL= 1.00

2.	7.	15.	23.	33.	41.	48.	51.	52.	49.
46.	42.	39.	36.	33.	31.	29.	26.	24.	23.
21.	19.	18.	17.	15.	14.	13.	12.	11.	10.
10.	9.	8.	8.	7.	6.	6.	6.	5.	5.
4.	4.	4.	3.	3.	3.	3.	3.	2.	2.
2.	2.	2.	2.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	0.	0.
0.	0.	0.							

0 END-OF-PERIOD FLOW

NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	23.36	23.18	2.38	19310.
										(649.)(589.)(60.)(546.80)			

HYDROGRAPH ROUTING

OUTFLOW HYDROGRAPH - DESIGN CONDITIONS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
OUT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1667.	-1

STAGE	1667.00	1668.00	1669.00	1670.00	1671.00	1672.00	1673.00	1674.00
FLOW	0.00	87.00	195.00	204.00	213.00	222.00	230.00	238.00
SURFACE AREA=	2.	6.	12.	17.	24.	25.		
CAPACITY=	0.	21.	65.	107.	109.	301.		
ELEVATION=	1652.	1657.	1662.	1665.	1665.	1673.		

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1667.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1670.5	0.0	0.0	0.

CREST LENGTH	0.	250.	1590.	2360.	2370.
AT OR BELOW ELEVATION	1670.5	1671.5	1672.0	1672.5	1674.0

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO STREAM BESIDE RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
US1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISHOW	ISAME	LOCAL
1	1	.55	0.00	.91	1.00	0.000	0	1	0

PRECIP DATA

SPFE	PRS	R6	R12	R24	R48	R72	R96
0.00	22.50	111.00	124.00	134.00	142.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA

TP= 2.38 CP= .45 NTA= 0

RECESSION DATA

STRTQ= -1.30 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 86 END-OF-PERIOD ORDINATES, LAG= 2.38 HOURS, CP= .45 VOL= 1.00

2.	8.	16.	25.	36.	46.	55.	62.	67.	69.
66.	62.	58.	54.	51.	48.	45.	42.	39.	37.
34.	32.	30.	28.	26.	25.	23.	21.	20.	19.
18.	16.	15.	14.	14.	13.	12.	11.	10.	10.
9.	8.	8.	7.	7.	7.	6.	6.	5.	5.
5.	4.	4.	4.	4.	3.	3.	3.	3.	3.
2.	2.	2.	2.	2.	2.	2.	2.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	0.	0.				

0 END-OF-PERIOD FLOW

HR.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	HR.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

SUM 31.95 29.55 2.40 35890.
(812.)(750.)(61.)(1016.29)

HYDROGRAPH ROUTING

CHANNEL ROUTING, SECTION BESIDE RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
000	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPWP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELMOT	ELMAX	RLSTR	SEL
.0350	.0350	.0350	1670.3	1680.3	100.	.01670

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 1680.30 0.00 1673.80 30.00 1671.30 45.00 1670.30 61.00 1670.30
76.00 1670.50 104.00 1681.50 104.00 1682.00

STORAGE	0.00	.02	.06	.11	.16	.22	.29	.37	.45	.54
	.62	.71	.80	.88	.97	1.06	1.16	1.25	1.36	1.47
OUTFLOW	0.00	33.69	122.60	267.33	520.04	825.29	1298.55	1685.57	2262.92	2913.73
	3633.12	4417.39	5263.56	6169.23	7132.41	8151.41	9262.78	10488.97	11787.06	13162.77
STAGE	1670.30	1670.63	1671.35	1671.88	1672.41	1672.93	1673.46	1673.98	1674.51	1675.04
	1675.56	1676.09	1676.62	1677.14	1677.67	1678.19	1678.72	1679.25	1679.77	1680.30
FLOW	0.00	33.69	122.60	267.33	520.04	825.29	1298.55	1685.57	2262.92	2913.73
	3633.12	4417.39	5263.56	6169.23	7132.41	8151.41	9262.78	10488.97	11787.06	13162.77

HYDROGRAPH ROUTING

SECTION 2000 FEET DOWNSTREAM OF DAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
001	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPWP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	0.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELMOT	ELMAX	RLSTR	SEL
.0700	.1000	.1000	1610.0	1617.0	1200.	.02000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 1622.40 186.00 1616.70 360.00 1613.00 360.00 1610.00 373.00 1610.00
383.00 1615.00 479.00 1615.40 677.00 1618.20

STORAGE	0.00	.06	.12	.19	.27	.36	.46	.56	.67	.79
	.92	1.05	1.20	1.38	1.63	3.00	5.21	8.11	11.71	15.90
OUTFLOW	0.00	1.95	6.14	12.12	19.79	29.15	40.20	53.12	67.84	84.47
	103.00	123.75	146.53	171.31	203.67	287.20	462.90	744.96	1151.56	1731.39
STAGE	1610.00	1610.37	1610.74	1611.11	1611.47	1611.84	1612.21	1612.58	1612.95	1613.32
	1613.68	1614.05	1614.42	1614.79	1615.16	1615.53	1615.89	1616.26	1616.63	1617.00
FLOW	0.00	1.95	6.14	12.12	19.79	29.15	40.20	53.12	67.84	84.47
	103.00	123.75	146.53	171.31	203.67	287.20	462.90	744.96	1151.56	1731.39

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .30	RATIO 2 .40	RATIO 3 .50
HYDROGRAPH AT	IN	.36	1	218.	291.	363.
	(	.93)	(	6.17)(	8.23)(	10.28)(
ROUTED TO	OUT	.36	1	134.	196.	204.
	(	.93)	(	4.35)(	5.56)(	5.77)(
HYDROGRAPH AT	USO	.55	1	380.	507.	634.
	(	1.42)	(	10.77)(	14.36)(	17.96)(
ROUTED TO	USO	.55	1	380.	507.	634.
	(	1.42)	(	10.77)(	14.36)(	17.96)(
2 COMBINED	COM	.91	1	509.	682.	831.
	(	2.36)	(	14.41)(	19.32)(	23.54)(
ROUTED TO	DSI	.91	1	508.	681.	831.
	(	2.36)	(	14.39)(	19.30)(	23.53)(

SUMMARY OF DAM SAFETY ANALYSIS
Without flashboards

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1667.00	1667.00	1679.50
STORAGE	155.	155.	240.
OUTFLOW	0.	0.	209.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	1668.62	0.00	195.	134.	0.00	44.00	0.00
.40	1669.14	0.00	207.	196.	0.00	44.25	0.00
.50	1669.96	0.00	227.	204.	0.00	44.75	0.00

PLAN 1 STATION USO

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS	
.30	380.	1672.1	42.25	TOP OF DAM AT
.40	507.	1672.4	42.25	ELEV. 1673.2
.50	634.	1672.6	42.25	

PLAN 1 STATION DSI

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS	
.30	508.	1616.0	42.75	2 HOURS AT 1617
.40	681.	1616.2	42.75	2 HOURS AT 1618
.50	831.	1616.3	42.25	

HYDROGRAPH ROUTING

OUTFLOW HYDROGRAPH - EXISTING CONDITIONS

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	IHAME	ISTAGE	IAUTO
OUT	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1669.	-1

STAGE	1668.00	1669.00	1670.00	1671.00	1672.00	1673.00
FLOW	0.00	87.00	211.00	220.00	228.00	236.00
SURFACE AREA=	2.	6.	12.	17.	24.	25.
CAPACITY=	0.	21.	65.	107.	199.	301.
ELEVATION=	1652.	1657.	1662.	1665.	1665.	1673.

CREL	SPVID	COOE	EXPE	ELEVL	COOL	CAREA	EXPL
1668.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1670.5	0.0	0.0	0.

CREST LENGTH	0.	250.	1500.	2360.	2370.
AT OR BELOW ELEVATION	1670.5	1671.5	1672.0	1672.5	1674.0

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .30	RATIO 2 .40	RATIO 3 .50
HYDROGRAPH AT	IN	.34	1	210.	291.	363.
	(	.93)	(	6.17)(	8.23)(	10.28)(
ROUTED TO	OUT	.34	1	158.	224.	300.
	(	.93)	(	4.48)(	6.34)(	8.49)(
HYDROGRAPH AT	US1	.55	1	380.	507.	634.
	(	1.42)	(	10.77)(	14.36)(	17.96)(
ROUTED TO	US0	.55	1	380.	507.	634.
	(	1.42)	(	10.77)(	14.36)(	17.96)(
2 COMBINED	COM	.91	1	514.	694.	897.
	(	2.36)	(	14.55)(	19.66)(	25.39)(
ROUTED TO	DS1	.91	1	513.	694.	895.
	(	2.36)	(	14.54)(	19.65)(	25.34)(

SUMMARY OF DAM SAFETY ANALYSIS

With flashboards

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1668.00	1668.00	1670.50
STORAGE	199.	199.	240.
OUTFLOW	0.	0.	176.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.30	1670.37	0.00	237.	158.	0.00	44.00	0.00
.40	1670.80	.30	248.	224.	4.00	43.75	0.00
.50	1671.12	.62	255.	300.	5.75	43.50	0.00

PLAN 1 STATION USD

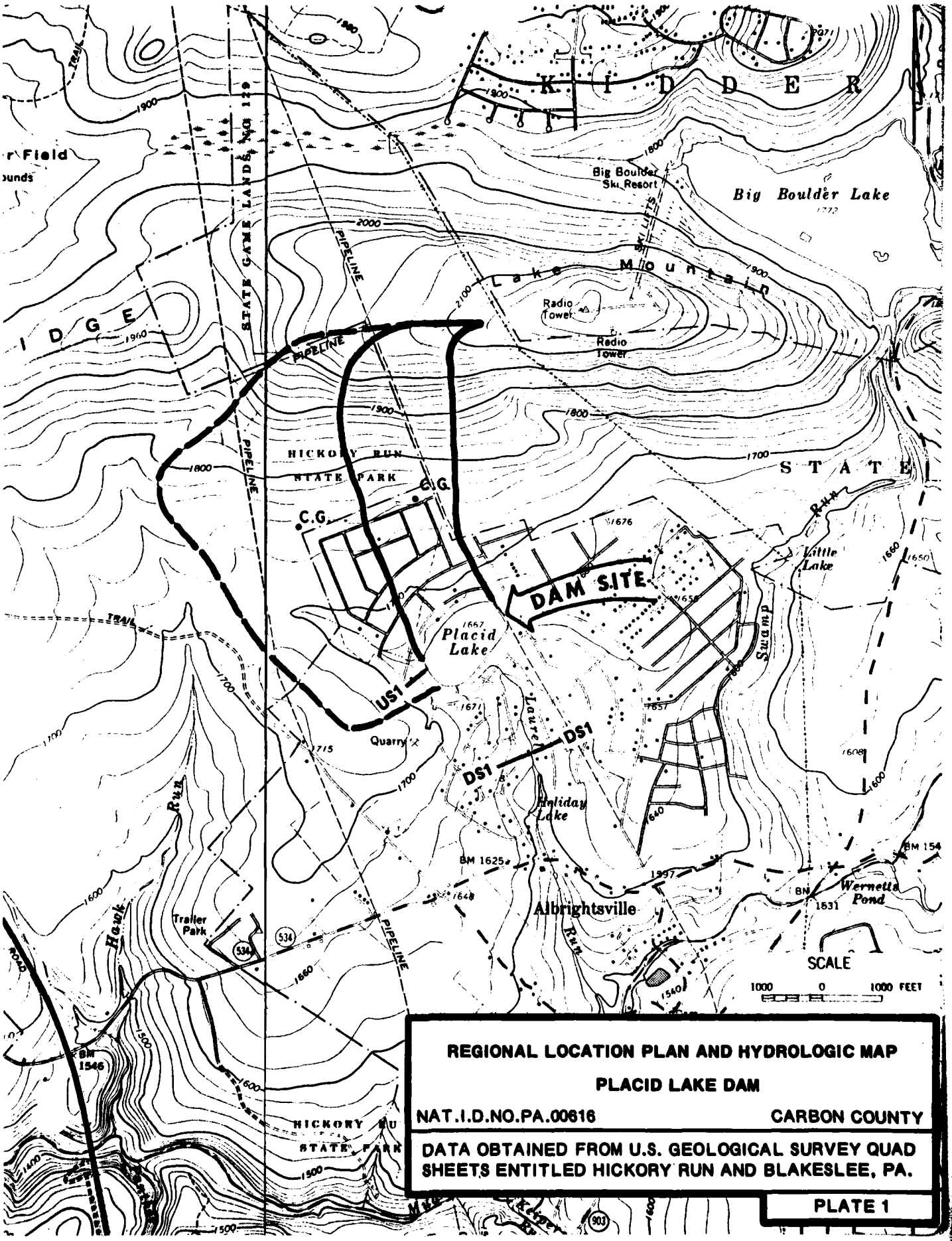
RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS	
.30	380.	1672.1	42.25	TOP OF DAM AT ELEV. 1673.2
.40	507.	1672.4	42.25	
.50	634.	1672.6	42.25	

PLAN 1 STATION DS1

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS	
.30	513.	1616.0	42.75	2 HOURS AT 1617
.40	694.	1616.2	42.75	2 HOURS AT 1618
.50	895.	1616.4	42.75	

APPENDIX

E



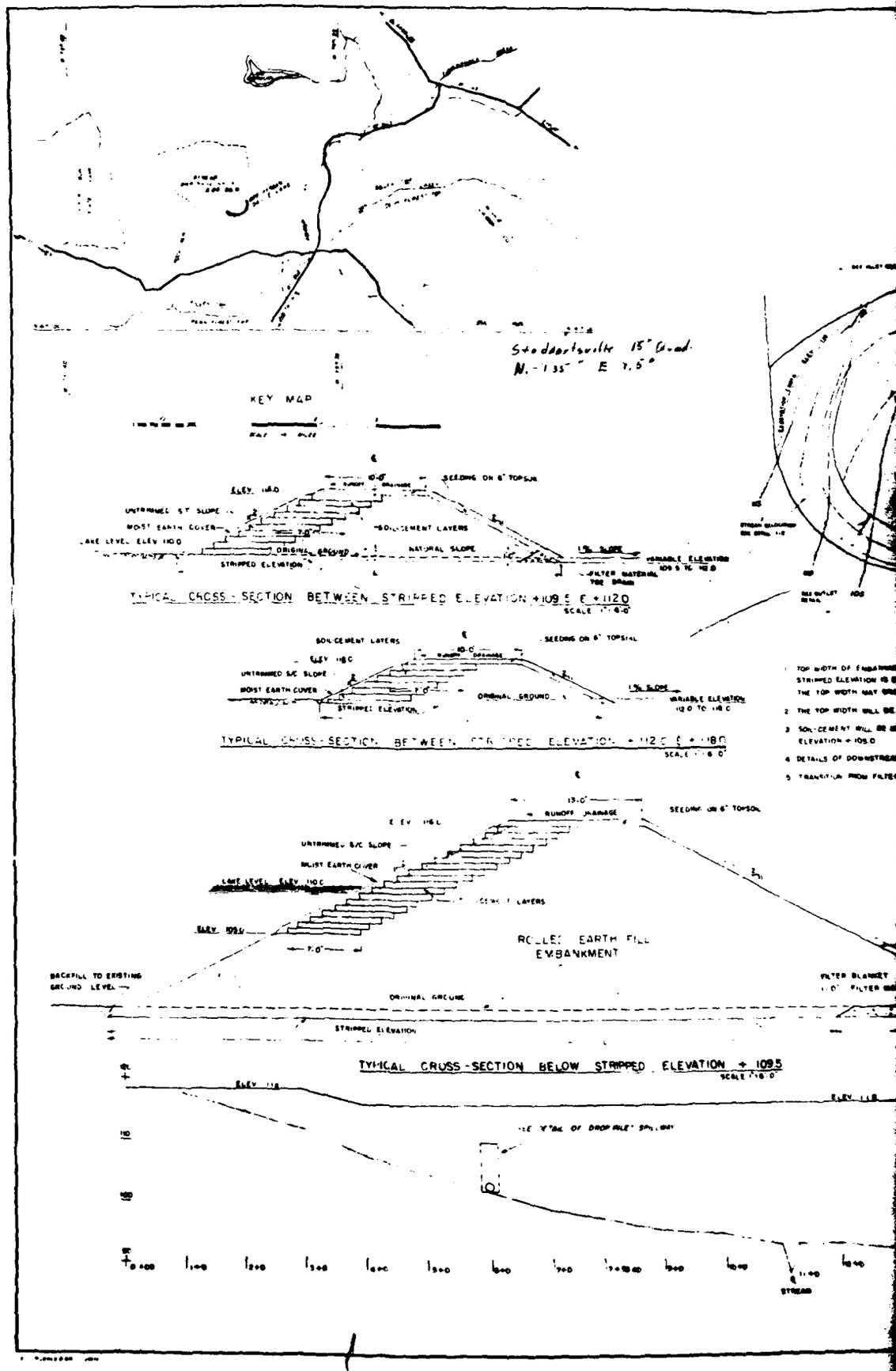
REGIONAL LOCATION PLAN AND HYDROLOGIC MAP

PLACID LAKE DAM

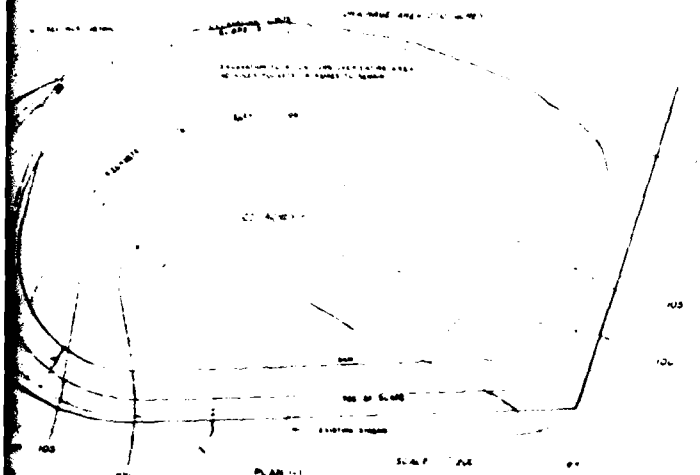
NAT.I.D.NO.PA.00616 **CARBON COUNTY**

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD SHEETS ENTITLED HICKORY RUN AND BLAKESLEE, PA.

PLATE 1


Stoddartsville 15' Quad.
N.-135° E 7.5°
KEY MAP
TYPICAL CROSS-SECTION BETWEEN STRIPPED ELEVATION +109.5 & +112.0
TYPICAL CROSS-SECTION BETWEEN STRIPPED ELEVATION +112.0 & +118.0
ROLLED EARTH FILL EMBANKMENT
TYPICAL CROSS-SECTION BELOW STRIPPED ELEVATION + 109.5

2
3



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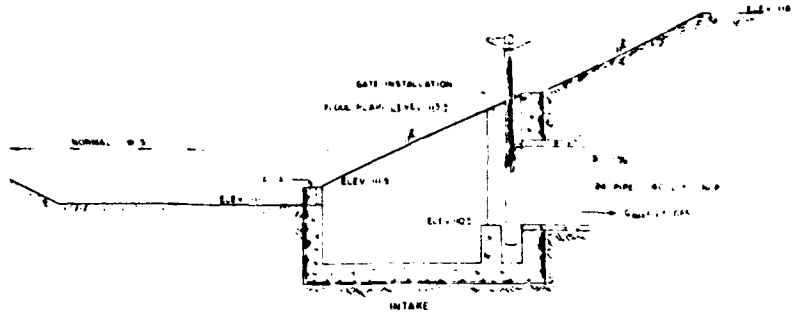
DETAIL 1-2

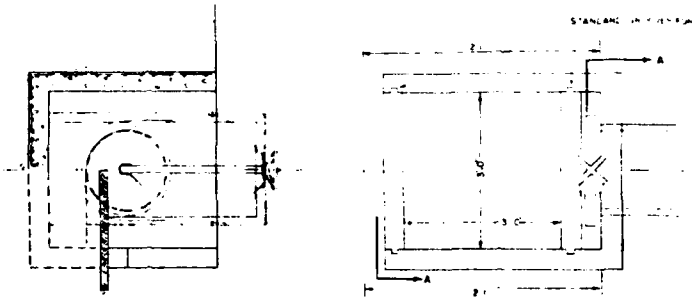
DOWNSTREAM CHANNEL CROSS SECTION

DAM PROFILE

PLATE 2



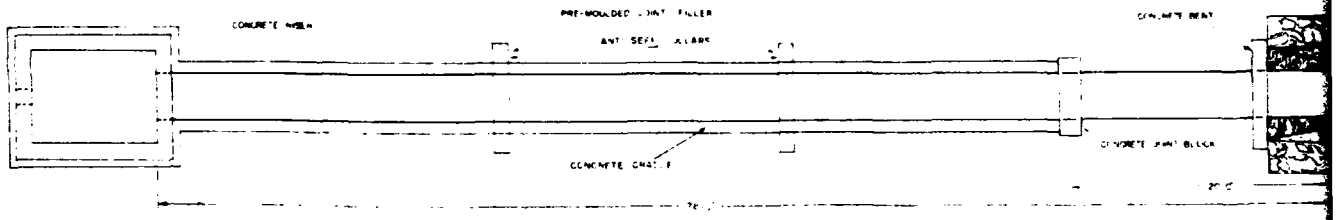
LONGITUDINAL ELEV ON CENTERLINE

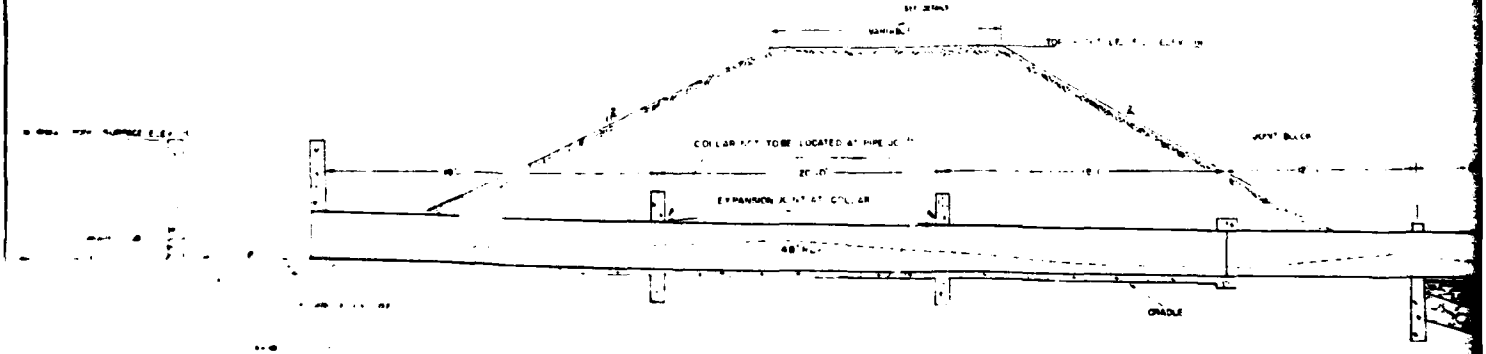


SECTIONAL ELEV AT A-A

PLAN

INLET STRUCTURE DETAIL 2-1



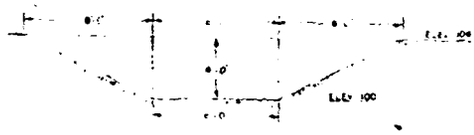


SECTION ON CENTERLINE OF PIPE

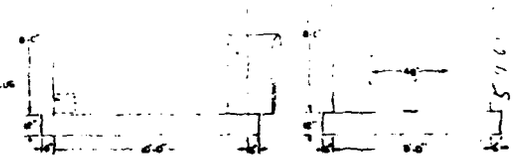
DROP INLET PIPE SPILLWAY

3
3

PLAN

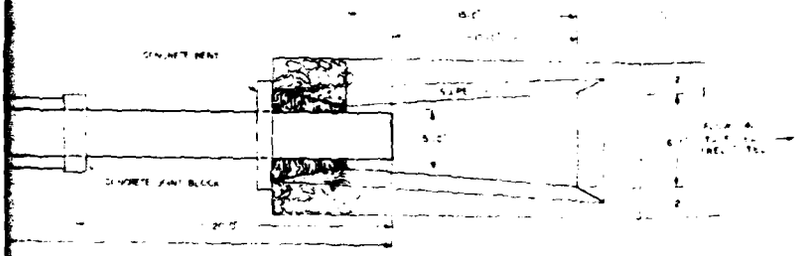


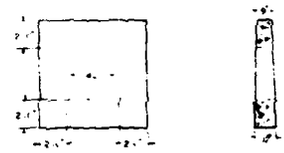
CHOPP SECTION OF CHANNEL FROM BASIN TO STREAM



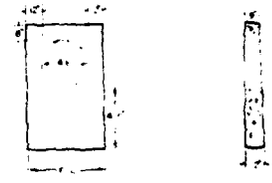
SECTION A-A SECTION B-B

CONCRETE BLOCK DROP INLET
RISER)

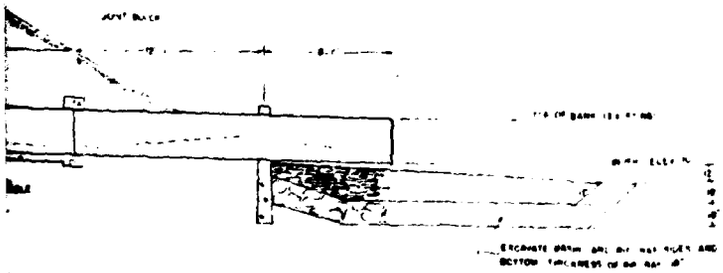


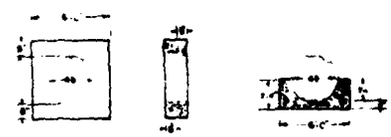


CONCRETE COLLAR



CONCRETE BENT





CONCRETE JOINT BLOCK CONCRETE CRADLE

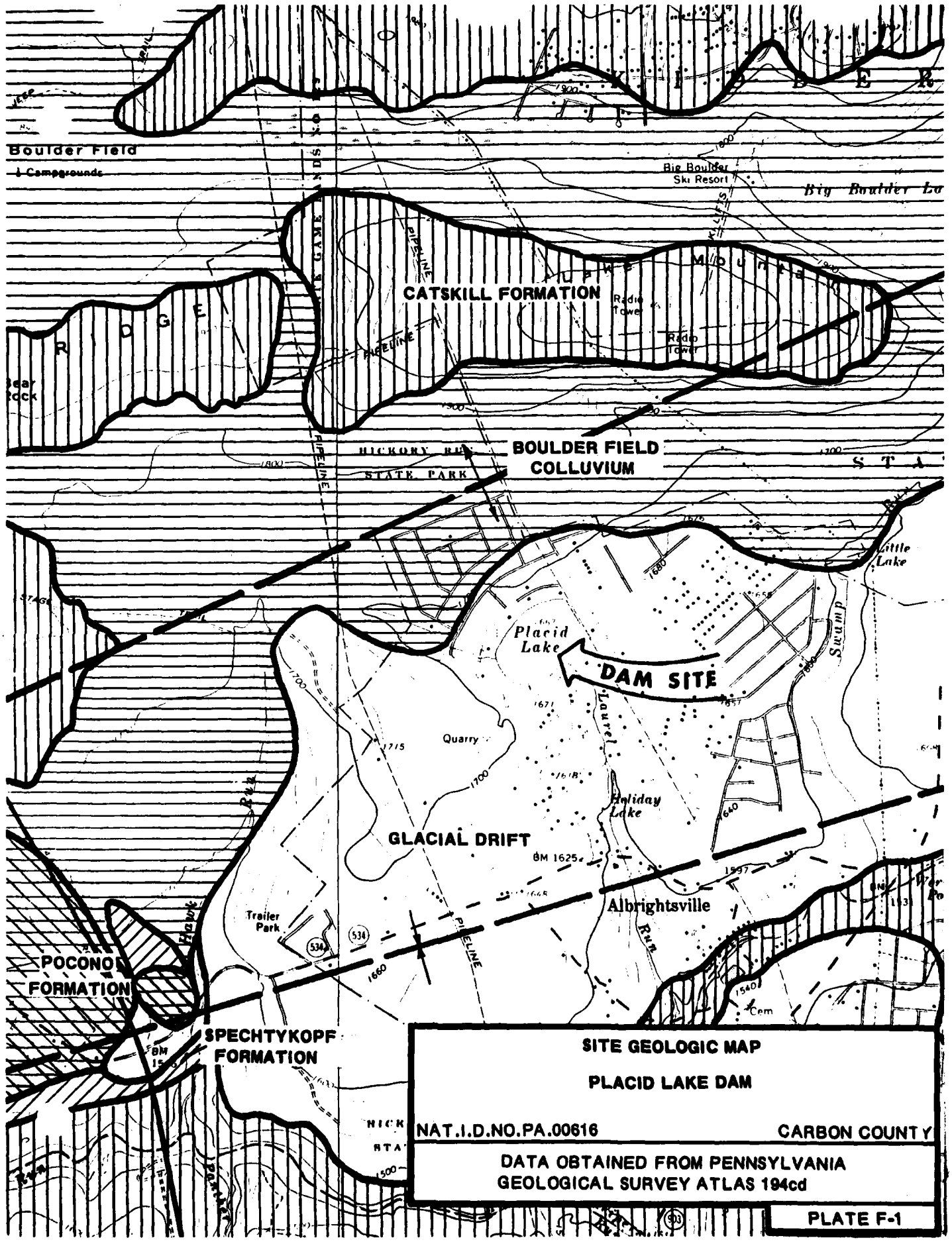
PLATE 3

APPENDIX

F

SITE GEOLOGY
PLACID LAKE DAM

Placid Lake Dam is located in the Pocono Plateau section of the Applachian Plateau Physiographic Province. As shown in Plate F-1, the dam site area is underlain by glacial drift of Pleistocene age which overlies the sandstone and siltstone bedrock belonging to the Duncannon member of the Upper Devonian age Catskill Formation. The unstratified glacial deposits in the dam site area consist of varying amounts of clay silt, sand and gravel with local accumulation of boulders especially north of the dam area. No bedrock exposures were observed at the dam during the field inspection. Approximately 1000 feet southeast of the dam a small area of sandstone is exposed in a shallow quarry. Here bedding strikes north-northeast and dips approximately 10 degrees to the northwest. Jointing strikes predominately near east-west dipping moderately to the south. The overall bedrock structure in this region is characterized by a series of northeast trending folds.



SITE GEOLOGIC MAP

PLACID LAKE DAM

NAT.I.D.NO.PA.00616 CARBON COUNTY

DATA OBTAINED FROM PENNSYLVANIA GEOLOGICAL SURVEY ATLAS 194cd

PLATE F-1


DATE
ILME